DROP-FORGINGS

and

DROP-FORGINGS ONLY

J. H. WILLIAMS & CO.

BROOKLYN, NEW YORK

1901

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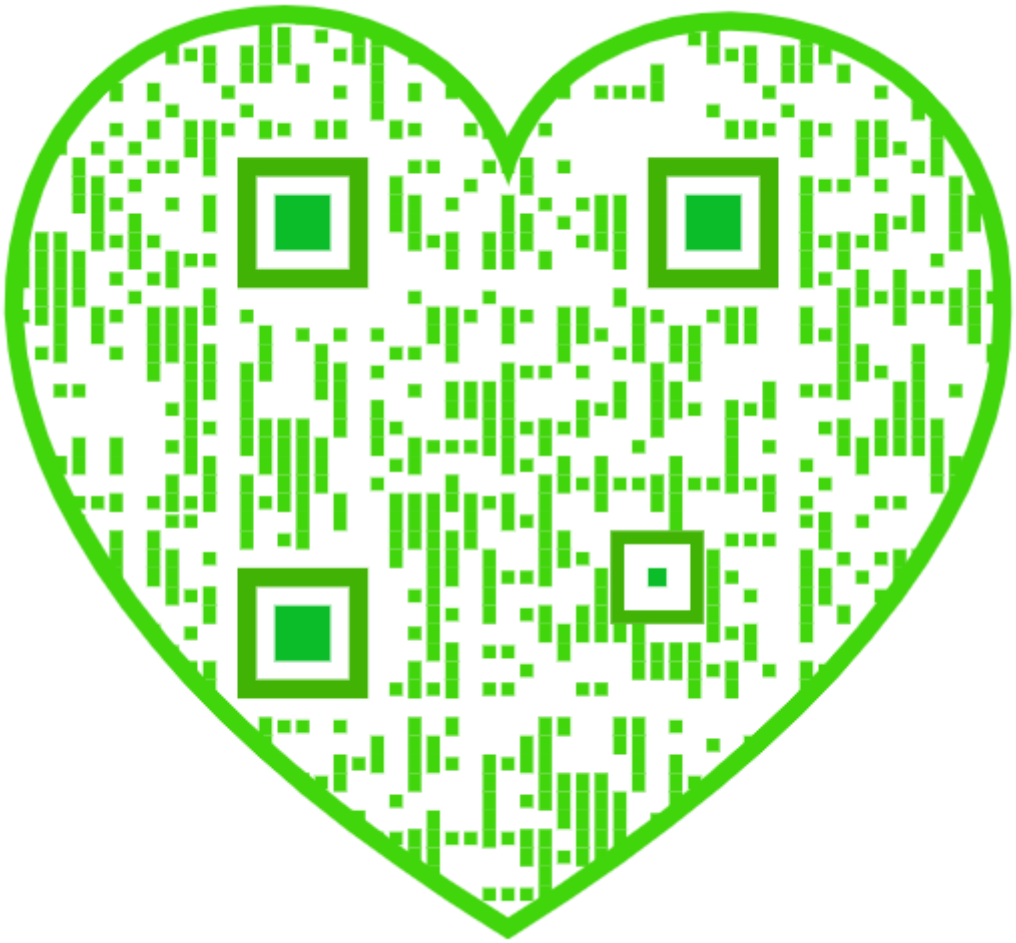

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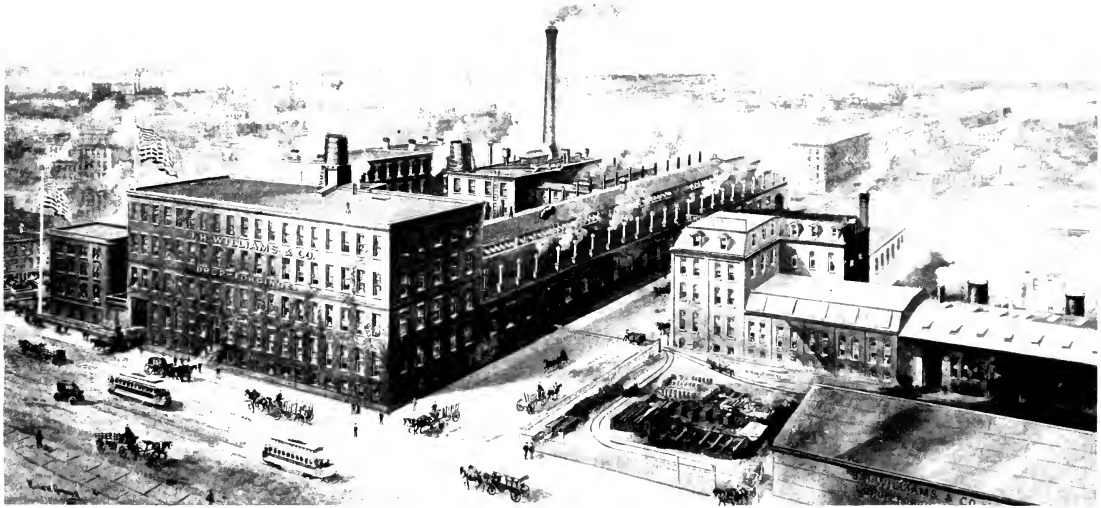
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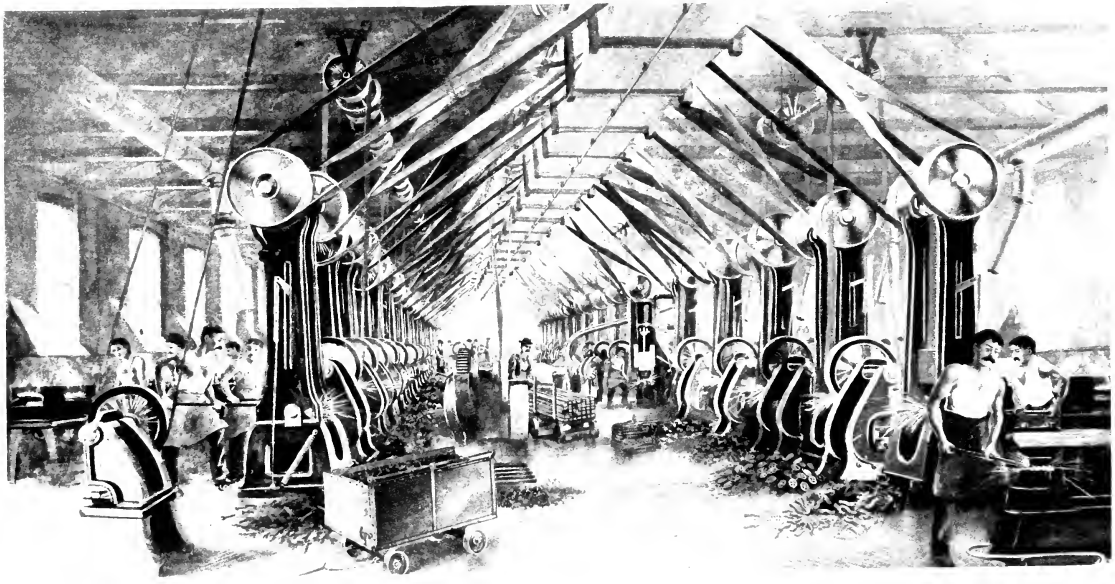

J. H. Williams & Co.

MANUFACTURERS OF IRON STEEL, COPPER, BRONZE AND ALUMINUM

Drop-Forgings

Business Established in Brooklyn, July 1, 1884. Incorporated, July 1, 1895

Tenth Edition — July, 1901

9 to 31 Richards St. and 1 to 29 Bowne St., near Hamilton Ferry, Brooklyn, New York, U. S. A.

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WE are sole makers of the

and Vulcan brands of drop-forged specialties.

Our factory is equipped with the best appliances for the accurate and economical production of drop-forgings. The works are protected against fire, not only by automatic sprinklers but by the most approved fire extinguishing and preventive apparatus and an efficient, drilled fire department composed of our employees. We therefore offer customers the use of the best known machinery in producing drop-forgings and give them ample protection against delays and losses from fire.

As our working force is skilled and experienced and we carry a varied stock of materials, we serve customers promptly and well.

Estimates furnished on receipt of model or drawing and specifications stating quantity required.

Annealing, Tempering and Case-Hardening done to order

Pamphlet descriptive of our Annealing, Case-Hardening and Tempering facilities will be sent on application.

Cuts and tables showing our goods are furnished for customer's catalogues; if desired we will prepare such matter for printer and correct proof.

Terms Cash

Payable in New York City par funds, with no allowance for exchange. All goods delivered on cars or boat, New York, without charge for packing or cartage.

Cable Address—"Willrich, Brooklyn"

Codes used:—Western Union, Lieber's Standard and "A. B. C." —fourth edition.

Private code in back: see pages 62 to 65.

ADDITIONS AND CHANGES

Appearing for the First Time in this Catalogue

NEW GOODS

Air Valves
Connecting Rods
Eye Bolts, new designs
Hammock Hooks
Handles for Car Registers
Igniter Levers
Starting Levers
Thumb Screws, new design
Toggle Pins
Wire Rope Sockets
Wrenches, Check Nut
Hexagon Cap Screw
Socket, new design
Spanners, Face
Spanners, Hook
Taper Handle

ADDITIONS

We have increased our established lines by adding sizes to

Ammonia Unions
Crank Shafts
Crank Handles
Eye Bolts
Hoist Hooks
Lathe Dogs
Rod Ends
Valve Stems
Wrenches, Double Head Tool Post
Double Head Engineers'
"S"
Single Head Box
Triple Head

CHANGES AFFECTING PRICES

Crank Shafts, new list prices
Hoist Hooks, reduced list prices
Rod Ends, new list prices
Thumb Nuts, new list price $\frac{3}{4}$ inch.
Valve Stems, new list prices
Wrenches, " " " for 274 to 286 inclusive, "S"
" " " " 20 & $20\frac{1}{2}$, Engineers'
" " " " 56 to 58 inclusive, Engineers'

CHANGE AFFECTING DESCRIPTION

Wrench No. $57\frac{1}{2}$ (page 11, Catalogue 1900) is now No. 58 (see page 14): no change in size.

WRENCHES

WE were the first to establish a uniform line of drop-forged Wrenches and to make them with the fifteen degree angle since generally adopted. Others have appropriated the results of our costly experimenting but we do not approve of imitating the patterns or brands of other makers; the goods shown herein are not copies. We offer a larger number of Wrenches than are made by any other manufacturer and the widest range of sizes. Wrenches for every size bolt from $\frac{1}{8}$ inch to 5 inch, inclusive, are in stock.

All Wrenches are, unless otherwise specified, in stock in three conditions, viz.:

UNFINISHED WRENCHES, plain forgings, with openings milled to fit the nut or screw on which they are to be used;

SEMI-FINISHED WRENCHES, milled to fit the nut or screw on which they are to be used and case-hardened **all over,** otherwise plain;

FINISHED WRENCHES, milled to fit the nut or screw on which they are to be used; ground, polished, case-hardened **all over,** lacquered, heads bright, packed in separate envelopes.

Unfinished, plain forgings (not milled) are furnished on demand; these have openings from $\frac{1}{32}$ to $\frac{1}{8}$ inch smaller than the finished sizes.

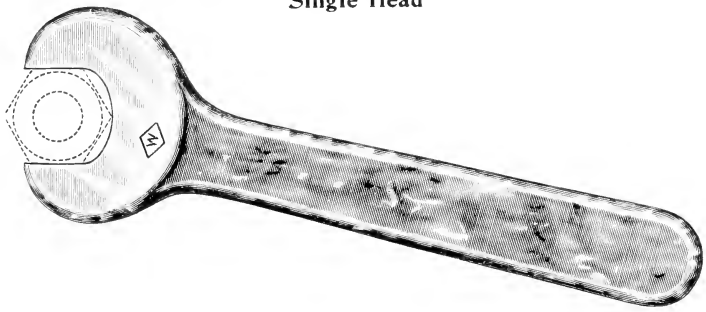
Engineers' Wrenches, pages 10 to 14, **Taper-handle Wrenches,** page 16, **Check-nut Wrenches,** pages 17 and 61, **Construction Wrenches,** page 23, and **Car Wrenches,** page 35, are in stock milled to fit U. S. and Whitworth Standard finished nuts. **Hexagon Cap-screw Wrenches,** page 15, are in stock milled to fit standard hexagon cap-screws. **Set-screw Wrenches,** pages 18 and 19 and **Box Wrenches,** page 17, are in stock for standard sizes of set-screws. **"S" Wrenches,** pages 20 to 22 and **Socket Wrenches,** pages 28 to 34, are in stock for either U. S. or Whitworth Standard finished nuts, set-screws or cap-screws. **Triple-head Wrenches,** page 23, **Machine Wrenches,** page 27 and **Tool-post Wrenches,** page 36, are in stock for either U. S. or Whitworth Standard finished nuts and set-screws respectively.

Wrenches are milled to International Standard, Metric Measure or special sizes without extra charge in lots of 25 or more of a size at a time.

Please use numbers when ordering; an order for "$\frac{1}{2}$ inch and $\frac{5}{8}$ inch wrenches" may mean bolts or openings of these sizes and may be any of several lines; an order for "$\frac{1}{2}$ inch and $\frac{5}{8}$ inch openings" may also mean either of several styles. Numbers alone are sure.

ENGINEERS' WRENCHES

Single Head



These wrenches and those on pages 12 to 14 and 16 are adapted for machine tools, locomotives, pumps, engines and general shop use; they will be milled to Metric Measure, International Standard or to special sizes when required.

A sample nut or screw for use as gauge should accompany orders for specially milled wrenches.

Each opening is at an angle of fifteen degrees with the handle, which admits of turning a hexagon nut completely around where the swing of the handle is limited to thirty degrees.

The unfinished, plain forgings (not milled) have openings from $\frac{1}{32}$ to $\frac{1}{8}$ inch smaller than the finished sizes. See on page 9 the conditions in which they are furnished.

When ordering please use numbers, and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Prices given for special wrenches upon receipt of models or drawings and on learning quantity required.

The following Semi-finished and Finished Wrenches have hole drilled in end of handle:

Number	17	18	19	19 1/2	20	20 1/2
Diameter Hole, inches . .	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1

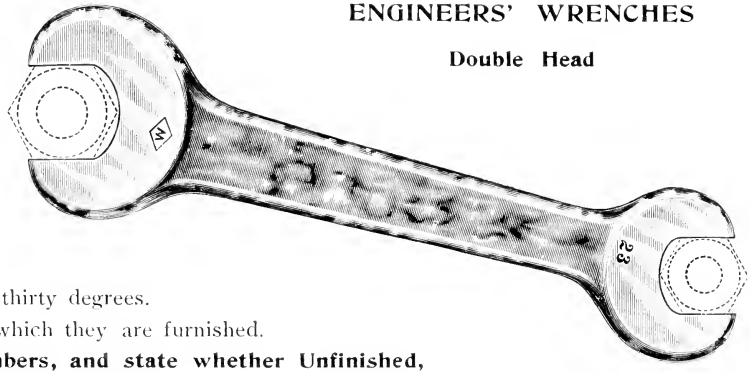
Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nut; Size Bolt	Opening Finished	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
00	**1/8**	$\frac{5}{16}$	$2\frac{1}{2}$	$\frac{3}{16}$	$ .08	$ .12	$ .16	**00**
0	**3/16**	$\frac{13}{32}$	$2\frac{7}{8}$	$\frac{7}{32}$	.09	.13	.18	**0**
1	**1/4**	$\frac{1}{2}$	$3\frac{1}{4}$	$\frac{1}{4}$	.10	.15	.20	**1**
2	**5/16**	$\frac{19}{32}$	$4\frac{3}{4}$	$\frac{9}{32}$	.12	.18	.24	**2**
3	**3/8**	$\frac{11}{16}$	$5\frac{5}{8}$	$\frac{5}{16}$	.14	.21	.28	**3**
4	**7/16**	$\frac{25}{32}$	$6\frac{1}{2}$	$\frac{11}{32}$	.17	.25	.34	**4**
5	**1/2**	$\frac{7}{8}$	$7\frac{1}{2}$	$\frac{6}{16}$	.20	.30	.40	**5**
6	**9/16**	$\frac{31}{32}$	$8\frac{3}{8}$	$\frac{7}{16}$	.25	.38	.50	**6**
7	**5/8**	$1\frac{1}{16}$	$9\frac{1}{4}$	$\frac{31}{64}$	.32	.48	.64	**7**
8	**3/4**	$1\frac{1}{4}$	$11\frac{1}{8}$	$\frac{9}{16}$	.40	.60	.80	**8**
9	**7/8**	$1\frac{7}{16}$	13	$\frac{21}{32}$	.50	.75	1.00	**9**
10	**1**	$1\frac{5}{8}$	$14\frac{7}{8}$	$\frac{3}{4}$	.65	.98	1.30	**10**
11	**1 1/8**	$1\frac{13}{16}$	$16\frac{5}{8}$	$\frac{53}{64}$	.85	1.28	1.70	**11**
12	**1 1/4**	2	$18\frac{1}{2}$	$\frac{29}{32}$	1.10	1.65	2.20	**12**
13	**1 3/8**	$2\frac{3}{16}$	$20\frac{1}{4}$	$\frac{63}{64}$	1.40	2.10	2.80	**13**
14	**1 1/2**	$2\frac{3}{8}$	$22\frac{1}{4}$	$1\frac{1}{16}$	1.75	2.63	3.50	**14**
15	**1 5/8**	$2\frac{9}{16}$	24	$1\frac{1}{8}$	2.10	3.15	4.20	**15**
16	**1 3/4**	$2\frac{3}{4}$	$25\frac{3}{8}$	$1\frac{7}{32}$	2.50	3.75	5.00	**16**
16½	**1 7/8**	$2\frac{15}{16}$	$25\frac{3}{8}$	$1\frac{5}{32}$	2.50	3.75	5.00	**16½**
17	**2**	$3\frac{1}{8}$	$29\frac{1}{2}$	$1\frac{3}{8}$	3.50	5.25	7.00	**17**
18	**2 1/4**	$3\frac{1}{2}$	33	$1\frac{17}{32}$	4.75	7.13	9.50	**18**
19	**2 1/2**	$3\frac{7}{8}$	37	$1\frac{5}{8}$	6.50	9.75	13.00	**19**
19½	**2 3/4**	$4\frac{1}{4}$	37	$1\frac{5}{8}$	6.50	9.75	13.00	**19½**
20	**3**	$4\frac{5}{8}$	44	$1\frac{7}{8}$	10.50	15.75	21.00	**20**
20½	**3 1/2**	$5\frac{3}{8}$	44	$1\frac{7}{8}$	10.50	15.75	21.00	**20½**

For Wrenches for nuts on 4, 4½ and 5 inch bolts see Nos. 521 and 521½, page 16.
List prices are changed on numbers 20 and 20½; ignore all previous lists.

ENGINEERS' WRENCHES

Double Head



These will be milled to Metric Measure, International Standard or to special sizes when required. A sample nut or screw for use as gauge should accompany orders for specially milled wrenches. Each opening is at an angle of fifteen degrees with the handle, which admits of turning a hexagon nut completely around where the swing of the handle is limited to thirty degrees.

See on page 9 the conditions in which they are furnished.

When ordering please use numbers, and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nuts; Size Bolts	Openings Finished	Extreme Length	Thickness Heads	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
21	**1/8 & 3/16**	$\frac{5}{16}$ & $\frac{13}{32}$	$3\frac{1}{4}$	$\frac{13}{64}$ & $\frac{7}{32}$	$ .12	$ .18	$ .24	**21**
22	**1/8 & 1/4**	$\frac{5}{16}$ & $\frac{1}{2}$	4	$\frac{13}{64}$ & $\frac{1}{4}$	.14	.21	.28	**22**
23	**3/16 & 1/4**	$\frac{13}{32}$ & $\frac{1}{2}$	4	$\frac{7}{32}$ & $\frac{1}{4}$	.15	.23	.30	**23**

24	3/16 & 5/16	13/32 & 19/32	47/8	7/32 & 9/32	$ .17	$ .25	$ .34	24
25	1/4 & 5/16	1/2 & 19/32	47/8	1/4 & 9/32	.18	.27	.36	25
26	1/4 & 3/8	1/2 & 11/16	57/8	1/4 & 5/16	.20	.30	.40	26
27	5/16 & 3/8	19/32 & 11/16	57/8	9/32 & 5/16	.21	.32	.42	27
28	5/16 & 7/16	19/32 & 25/32	67/8	9/32 & 11/32	.23	.35	.46	28
29	3/8 & 7/16	11/16 & 25/32	67/8	5/16 & 11/32	.25	.38	.50	29
30	3/8 & 1/2	11/16 & 7/8	73/4	5/16 & 25/64	.28	.42	.56	30
31	7/16 & 1/2	25/32 & 7/8	73/4	11/32 & 25/64	.30	.45	.60	31
32	7/16 & 9/16	25/32 & 31/32	83/4	11/32 & 7/16	.34	.51	.68	32
33	1/2 & 9/16	7/8 & 31/32	83/4	25/64 & 7/16	.36	.54	.72	33
34	1/2 & 5/8	7/8 & 1 1/16	93/4	25/64 & 31/64	.41	.61	.82	34
35	9/16 & 5/8	31/32 & 1 1/16	93/4	7/16 & 31/64	.43	.65	.86	35
36	9/16 & 3/4	31/32 & 1 1/4	115/8	7/16 & 9/16	.50	.75	1.00	36
37	5/8 & 3/4	1 1/16 & 1 1/4	115/8	31/64 & 9/16	.53	.80	1.06	37
38	5/8 & 7/8	1 1/16 & 1 7/16	131/2	31/64 & 21/32	.62	.93	1.24	38
39	3/4 & 7/8	1 1/4 & 1 7/16	131/2	9/16 & 21/32	.65	.98	1.30	39
40	3/4 & 1	1 1/4 & 1 5/8	151/2	9/16 & 3/4	.78	1.17	1.56	40
41	7/8 & 1	1 7/16 & 1 5/8	151/2	21/32 & 3/4	.82	1.23	1.64	41
42	7/8 & 1 1/8	1 7/16 & 1 13/16	173/8	21/32 & 53/64	1.00	1.50	2.00	42
43	1 & 1 1/8	1 5/8 & 1 13/16	173/8	3/4 & 53/64	1.08	1.62	2.16	43
44	1 & 1 1/4	1 5/8 & 2	193/8	3/4 & 29/32	1.27	1.91	2.54	44
45	1 1/8 & 1 1/4	1 13/16 & 2	193/8	53/64 & 29/32	1.35	2.03	2.70	45
46	1 1/8 & 1 3/8	1 13/16 & 2 3/16	211/4	53/64 & 63/64	1.65	2.48	3.30	46
47	1 1/4 & 1 3/8	2 & 2 3/16	211/4	29/32 & 63/64	1.75	2.63	3.50	47
48	1 1/4 & 1 1/2	2 & 2 3/8	231/4	29/32 & 1 1/16	2.10	3.15	4.20	48
49	1 3/8 & 1 1/2	2 3/16 & 2 3/8	231/4	63/64 & 1 1/16	2.25	3.38	4.50	49

For additional sizes see following page.

ENGINEERS' WRENCHES—Continued

Double Head

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nuts; Size Bolts	Openings Finished	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
50	**1 3/8 & 1 5/8**	$2\frac{3}{16}$ & $2\frac{9}{16}$	$25\frac{1}{8}$	$\frac{63}{64}$ & $1\frac{1}{8}$	$ 2.65	$ 3.98	$ 5.30	**50**
51	**1 1/2 & 1 5/8**	$2\frac{3}{8}$ & $2\frac{9}{16}$	$25\frac{1}{8}$	$1\frac{1}{16}$ & $1\frac{1}{8}$	2.85	4.28	5.70	**51**
52	**1 1/2 & 1 3/4**	$2\frac{3}{8}$ & $2\frac{3}{4}$	$27\frac{1}{8}$	$1\frac{1}{16}$ & $1\frac{7}{32}$	3.30	4.95	6.60	**52**
53	**1 5/8 & 1 3/4**	$2\frac{9}{16}$ & $2\frac{3}{4}$	$27\frac{1}{8}$	$1\frac{1}{8}$ & $1\frac{7}{32}$	3.55	5.33	7.10	**53**
$53\frac{1}{2}$	**1 5/8 & 1 7/8**	$2\frac{9}{16}$ & $2\frac{15}{16}$	$27\frac{1}{8}$	$1\frac{1}{8}$ & $1\frac{7}{32}$	3.55	5.33	7.10	**$53\frac{1}{2}$**
54	**1 5/8 & 2**	$2\frac{9}{16}$ & $3\frac{1}{8}$	$30\frac{7}{8}$	$1\frac{1}{8}$ & $1\frac{3}{8}$	4.15	6.23	8.30	**54**
55	**1 3/4 & 2**	$2\frac{3}{4}$ & $3\frac{1}{8}$	$30\frac{7}{8}$	$1\frac{7}{32}$ & $1\frac{3}{8}$	4.55	6.83	9.10	**55**
$55\frac{1}{2}$	**1 7/8 & 2**	$2\frac{15}{16}$ & $3\frac{1}{8}$	$30\frac{7}{8}$	$1\frac{7}{32}$ & $1\frac{3}{8}$	4.55	6.83	9.10	**$55\frac{1}{2}$**
56	**1 3/4 & 2 1/4**	$2\frac{3}{4}$ & $3\frac{1}{2}$	$34\frac{5}{8}$	$1\frac{7}{32}$ & $1\frac{17}{32}$	5.45	8.18	10.90	**56**
$56\frac{1}{2}$	**1 7/8 & 2 1/4**	$2\frac{15}{16}$ & $3\frac{1}{2}$	$34\frac{5}{8}$	$1\frac{7}{32}$ & $1\frac{17}{32}$	5.45	8.18	10.90	**$56\frac{1}{2}$**
57	**2 & 2 1/4**	$3\frac{1}{8}$ & $3\frac{1}{2}$	$34\frac{5}{8}$	$1\frac{3}{8}$ & $1\frac{17}{32}$	6.15	9.23	12.30	**57**
$57\frac{1}{2}$	**2 & 2 1/2**	$3\frac{1}{8}$ & $3\frac{7}{8}$	$34\frac{5}{8}$	$1\frac{3}{8}$ & $1\frac{17}{32}$	6.15	9.23	12.30	**$57\frac{1}{2}$**
58	**2 1/4 & 2 1/2**	$3\frac{1}{2}$ & $3\frac{7}{8}$	$34\frac{5}{8}$	$1\frac{3}{8}$ & $1\frac{17}{32}$	6.15	9.23	12.30	**58**
59	**2 1/4 & 2 3/4**	$3\frac{1}{2}$ & $4\frac{1}{4}$	39	$1\frac{17}{32}$ & $1\frac{5}{8}$	8.45	12.68	16.90	**59**
60	**2 1/2 & 2 3/4**	$3\frac{7}{8}$ & $4\frac{1}{4}$	39	$1\frac{5}{8}$ & $1\frac{5}{8}$	9.75	14.63	19.50	**60**
61	**2 1/2 & 3**	$3\frac{7}{8}$ & $4\frac{5}{8}$	46	$1\frac{5}{8}$ & $1\frac{7}{8}$	13.25	19.88	26.50	**61**
62	**2 3/4 & 3**	$4\frac{1}{4}$ & $4\frac{5}{8}$	46	$1\frac{5}{8}$ & $1\frac{7}{8}$	13.25	19.88	26.50	**62**
63	**2 3/4 & 3 1/2**	$4\frac{1}{4}$ & $5\frac{3}{8}$	46	$1\frac{5}{8}$ & $1\frac{7}{8}$	13.25	19.88	26.50	**63**
64	**3 & 3 1/2**	$4\frac{5}{8}$ & $5\frac{3}{8}$	46	$1\frac{7}{8}$ & $1\frac{7}{8}$	15.75	23.63	31.50	**64**

List prices are changed on numbers 56 to 58, inclusive; ignore all previous lists.

HEXAGON CAP-SCREW WRENCHES

These are made from the Wrenches described on pages 11, 12 and 13 by milling the openings to the sizes shown on following table to fit the heads of standard hexagon-head cap-screws. All the sizes shown are kept in stock; see, on page 9, the conditions in which they are furnished. **When ordering, please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.**

Unfinished Wrenches have Milled Openings

SINGLE HEAD

Number	For Hexagon Head Cap-screws; Diameter of Screws	Openings Finished	Extreme Length	Thickness of Head	Price Unfinished	Price Semi-Finis'd	Price Finished	Number
700	**3/16**	**3/8**	2 7/8	7/32	$.09	$.13	$.18	**700**
701	**1/4**	**7/16**	3 3/4	1/4	.10	.15	.20	**701**
701a	**5/16**	**1/2**	3 3/4	1/4	.10	.15	.20	**701a**
702	**3/8**	**9/16**	4 3/4	9/32	.12	.18	.24	**702**
703	**7/16**	**5/8**	5 5/8	5/16	.14	.21	.28	**703**
704	**1/2**	**3/4**	6 1/2	11/32	.17	.25	.34	**704**
705	**9/16**	**13/16**	7 1/2	25/64	.20	.30	.40	**705**
705a	**5/8**	**7/8**	7 1/2	25/64	.20	.30	.40	**705a**
706	**3/4**	**1**	8 3/8	7/16	.25	.38	.50	**706**
707	**7/8**	**1 1/8**	9 1/4	31/64	.32	.48	.64	**707**
708	**1**	**1 1/4**	11 1/8	9/16	.40	.60	.80	**708**

DOUBLE HEAD

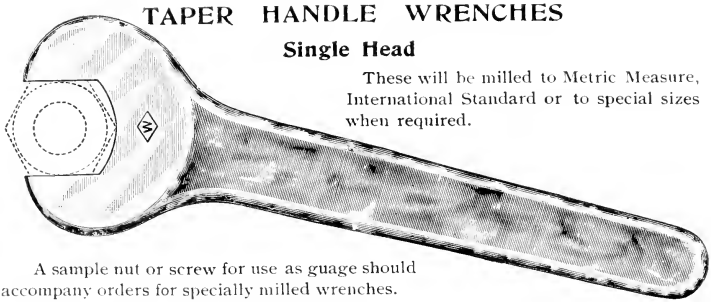
723	**3/16 & 1/4**	**3/8 & 7/16**	4	7/32 & 1/4	.15	.23	.30	**723**
723a	**3/16 & 5/16**	**3/8 & 1/2**	4	7/32 & 1/4	.15	.23	.30	**723a**
724	**3/16 & 3/8**	**3/8 & 9/16**	4 7/8	7/32 & 9/32	.17	.25	.34	**724**
725	**1/4 & 5/16**	**7/16 & 1/2**	4 7/8	1/4 & 9/32	.18	.27	.36	**725**
725a	**1/4 & 3/8**	**7/16 & 9/16**	4 7/8	1/4 & 9/32	.18	.27	.36	**725a**
725b	**5/16 & 3/8**	**1/2 & 9/16**	4 7/8	1/4 & 9/32	.18	.27	.36	**725b**
726	**5/16 & 7/16**	**1/2 & 5/8**	5 7/8	1/4 & 5/16	.20	.30	.40	**726**
727	**3/8 & 7/16**	**9/16 & 5/8**	5 7/8	9/32 & 5/16	.21	.32	.42	**727**
728	**3/8 & 1/2**	**9/16 & 3/4**	6 7/8	9/32 & 11/32	.23	.35	.46	**728**
729	**7/16 & 1/2**	**5/8 & 3/4**	6 7/8	5/16 & 11/32	.25	.38	.50	**729**
730	**7/16 & 9/16**	**5/8 & 13/16**	7 3/4	5/16 & 25/64	.28	.42	.56	**730**
731	**1/2 & 9/16**	**3/4 & 13/16**	7 3/4	11/32 & 25/64	.30	.45	.60	**731**
731a	**1/2 & 5/8**	**3/4 & 7/8**	7 3/4	11/32 & 25/64	.30	.45	.60	**731a**
731b	**9/16 & 5/8**	**13/16 & 7/8**	7 3/4	11/32 & 25/64	.30	.45	.60	**731b**
732	**1/2 & 3/4**	**3/4 & 1**	8 3/4	11/32 & 7/16	.34	.51	.68	**732**
732a	**9/16 & 3/4**	**13/16 & 1**	8 3/4	11/32 & 7/16	.34	.51	.68	**732a**
733	**5/8 & 3/4**	**7/8 & 1**	8 3/4	25/64 & 7/16	.36	.54	.72	**733**
734	**5/8 & 7/8**	**7/8 & 1 1/8**	9 3/4	25/64 & 31/64	.41	.61	.82	**734**
735	**3/4 & 7/8**	**1 & 1 1/8**	9 3/4	7/16 & 31/64	.43	.65	.86	**735**
736	**3/4 & 1**	**1 & 1 1/4**	11 5/8	7/16 & 9/16	.50	.75	1.00	**736**
737	**7/8 & 1**	**1 1/8 & 1 1/4**	11 5/8	31/64 & 9/16	.53	.80	1.06	**737**

Larger or special sizes, either single or double-head, to order.

TAPER HANDLE WRENCHES

Single Head

These will be milled to Metric Measure, International Standard or to special sizes when required.



A sample nut or screw for use as guage should accompany orders for specially milled wrenches.

Each opening is at an angle of fifteen degrees with the handle, which admits of turning a hexagon nut completely around where the swing of the handle is limited to thirty degrees.

See on page 9 the conditions in which they are furnished.

When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

The following Semi-finished and Finished Wrenches have hole drilled in end of handle:

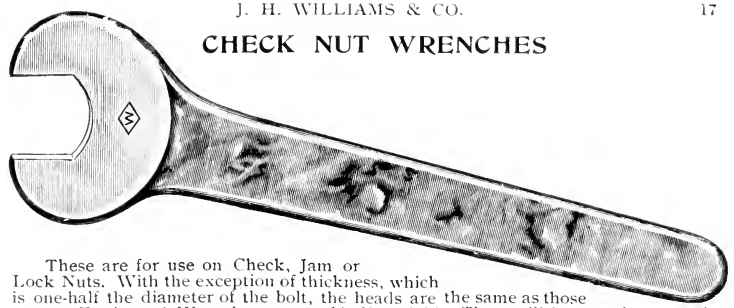
Number,	517	518	519	519½	520	520½	521	521½
Diameter Hole, inches,	5/8	3/4	7/8	7/8	1	1	1¼	1¼

Unfinished Wrenches have Milled Openings.

Number	For U. S. Standard Nut; Size Bolt	Opening Finished	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
501	**1/4**	1/2	3 3/4	1/4	$ .10	$ .15	$ .20	**501**
502	**5/16**	19/32	4 3/4	9/32	.12	.18	.24	**502**
503	**3/8**	11/16	5 5/8	5/16	.14	.21	.28	**503**
504	**7/16**	25/32	6 1/2	11/32	.17	.25	.34	**504**
505	**1/2**	7/8	7 1/2	25/64	.20	.30	.40	**505**
506	**9/16**	31/32	8 3/8	7/16	.25	.38	.50	**506**
507	**5/8**	1 1/16	9 1/4	31/64	.32	.48	.64	**507**
508	**3/4**	1 1/4	11 1/8	9/16	.40	.60	.80	**508**
509	**7/8**	1 7/16	13	21/32	.50	.75	1.00	**509**
510	**1**	1 5/8	14 7/8	3/4	.65	.98	1.30	**510**
511	**1 1/8**	1 13/16	16 5/8	53/64	.85	1.28	1.70	**511**
512	**1 1/4**	2	18 1/2	29/32	1.10	1.65	2.20	**512**
513	**1 3/8**	2 3/16	20 1/4	63/64	1.40	2.10	2.80	**513**
514	**1 1/2**	2 3/8	22 1/4	1 1/16	1.75	2.63	3.50	**514**
515	**1 5/8**	2 9/16	24	1 1/8	2.10	3.15	4.20	**515**
516	**1 3/4**	2 3/4	25 3/8	1 7/32	2.50	3.75	5.00	**516**
516½	**1 7/8**	2 15/16	25 3/8	1 7/32	2.50	3.75	5.00	**516½**
517	**2**	3 1/8	29 1/2	1 3/8	3.50	5.25	7.00	**517**
518	**2 1/4**	3 1/2	33	1 17/32	4.75	7.13	9.50	**518**
519	**2 1/2**	3 7/8	37	1 5/8	6.50	9.75	13.00	**519**
519½	**2 3/4**	4 1/4	37	1 5/8	6.50	9.75	13.00	**519½**
520	**3**	4 5/8	44	1 7/8	10.50	15.75	21.00	**520**
520½	**3 1/2**	5 3/8	44	1 7/8	10.50	15.75	21.00	**520½**
521	**4**	6 1/8	59	2 5/8	27.50	41.25	55.00	**521**
521½	**4 1/2**	6 7/8	59	2 5/8	27.50	41.25	55.00	**521½**

No. 521 milled to order for nuts on 5 inch bolts.

CHECK NUT WRENCHES



These are for use on Check, Jam or Lock Nuts. With the exception of thickness, which is one-half the diameter of the bolt, the heads are the same as those on our Engineers' Wrenches, pages 10, 11 and 16. They will be milled to Metric Measure, International Standard or to special sizes when required. A sample nut or screw for use as gauge should accompany orders for specially milled wrenches.

Each opening is at an angle of fifteen degrees with the handle, which admits of turning a hexagon nut completely around where the swing of the handle is limited to thirty degrees. Other sizes in preparation.

See on page 9 the conditions in which they are furnished.

When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Unfinished Wrenches have Milled Openings

Number	For U. S. Stand'rd Nut; Size Bolt	Opening, Finished	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
602	**5/16**	19/32	4 1/4	11/64	$ .11	$ .17	$ .22	**602**
603	**3/8**	11/16	5 1/2	3/16	.13	.20	.26	**603**
604	**7/16**	25/32	5 7/8	7/64	.15	.23	.30	**604**
605	**1/2**	7/8	6 5/8	1/4	.18	.27	.36	**605**
607	**5/8**	1 1/16	8 1/4	5/16	.28	.42	.56	**607**
608	**3/4**	1 1/4	10	3/8	.36	.54	.72	**608**
609	**7/8**	1 7/16	11 1/2	7/16	.46	.69	.92	**609**
610	**1**	1 5/8	13 1/4	1/2	.59	.89	1.18	**610**

For Double Head Check-Nut Wrench No. 97½, see page 61.

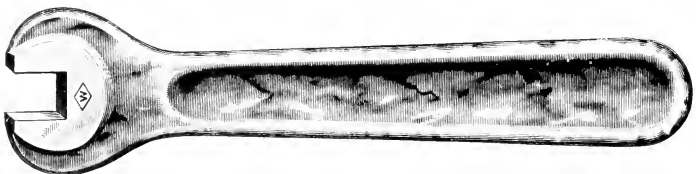
SINGLE HEAD BOX WRENCHES

These can be broached to hexagonal openings if desired; sizes and prices on application. See on page 9 the conditions in which they are furnished.

When ordering, please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Number	For Set-Screw; Size	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
107	**3/16**	3	1/4	$ .09	$ .12	$ .18	**107**
108	**1/4**	3 3/8	5/16	.10	.15	.20	**108**
109	**5/16**	3 3/4	3/8	.11	.17	.22	**109**
110	**3/8**	4 1/4	7/16	.13	.20	.26	**110**
111	**7/16**	4 5/8	1/2	.16	.24	.32	**111**
112	**1/2**	5 1/8	9/16	.19	.28	.38	**112**
113	**9/16**	6	5/8	.22	.33	.44	**113**
114	**5/8**	7	11/16	.26	.39	.52	**114**
115	**3/4**	8	3/4	.30	.45	.60	**115**
116	**7/8**	9	11/16	.36	.54	.72	**116**
117	**1**	10	1	.44	.66	.88	**117**

SINGLE HEAD SET-SCREW WRENCHES



These can be milled one or two sizes larger than stated in table. See on page 9 the conditions in which they are furnished.

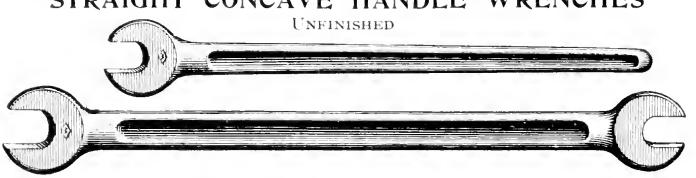
When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Unfinished Wrenches have Milled Openings

Number	For Set-Screw; Size	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished.	Price, Finished	Number
92	**3/16**	3	3/16	$ .08	$ .12	$ .16	**92**
93	**1/4**	3 5/8	1/4	.10	.15	.20	**93**
94	**5/16**	4 1/2	5/16	.12	.18	.24	**94**
95	**3/8**	5 3/8	11/32	.15	.23	.30	**95**
96	**7/16**	6 1/4	3/8	.20	.30	.40	**96**
97	**1/2**	7	7/16	.25	.38	.50	**97**
98	**9/16**	7 1/2	1/2	.27	.41	.54	**98**
99	**5/8**	8	9/16	.30	.45	.60	**99**
100	**3/4**	9 1/4	5/8	.35	.53	.70	**100**
101	**7/8**	10 1/2	11/16	.42	.63	.84	**101**
102	**1**	11 1/2	3/4	.50	.75	1.00	**102**
103	**1 1/8**	12	13/16	.60	.90	1.20	**103**

STRAIGHT CONCAVE HANDLE WRENCHES

UNFINISHED

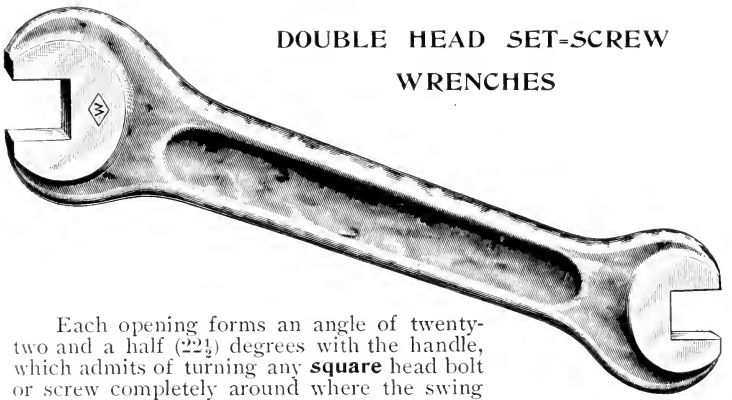


Openings milled to special sizes when required. Semi-finished and Finished to order. See on page 9 explanation of these conditions.

Please use numbers when ordering

Number	Kind	Outside Diameter of Nuts	Openings Unfinished	Extreme Length	Thickness Head	Price, Unfinished	Number
173	Single Head	1 3/16	1 1/4	23	3/4	$ .60	**173**
174	" "	1 1/4	1 5/16	23	3/4	.60	**174**
175	" "	1 3/8	1 7/16	23	3/4	.60	**175**
176	" "	1 1/2	1 9/16	23	3/4	.60	**176**
182	Double "	1 3/16 & 1 1/4	1 1/4 & 1 5/16	24	3/4	.90	**182**
184	" "	1 1/4 & 1 3/8	1 5/16 & 1 7/16	24	3/4	.90	**184**
186	" "	1 1/4 & 1 1/2	1 5/16 & 1 9/16	24	3/4	.90	**186**
188	" "	1 3/8 & 1 1/2	1 7/16 & 1 9/16	24	3/4	.90	**188**

Weight of Single Head, 3¾ lbs.; of Double Head, 5 lbs.



DOUBLE HEAD SET-SCREW WRENCHES

Each opening forms an angle of twenty-two and a half ($22\frac{1}{2}$) degrees with the handle, which admits of turning any **square** head bolt or screw completely around where the swing of the handle is limited to forty-five degrees.

These Wrench Forgings are made in **ten** sizes, as per **odd** numbers but **twenty** sizes **Unfinished, Semi-finished** and **Finished** wrenches are made (see list), as each forging is milled to two combinations.

These wrenches can be milled one or two sizes larger than stated in table.

When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

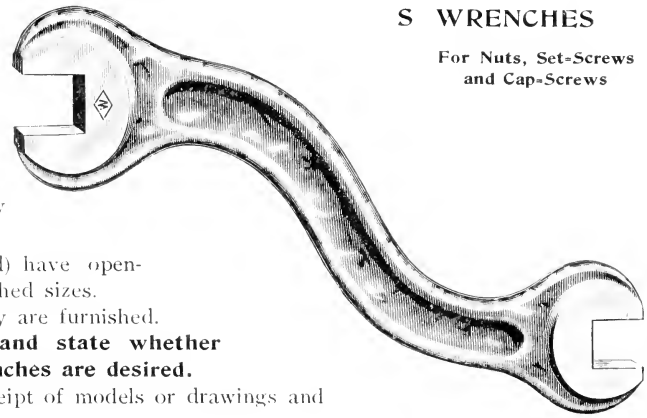
See on page 9 the conditions in which they are furnished.

Unfinished Wrenches have Milled Openings

Number	For Set-Screws; Size	Extreme Length	Thickness Heads	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
65	**3/16 & 1/4**	$3\frac{3}{8}$	$\frac{3}{16}$ & $\frac{1}{4}$	$ .13	$ .20	$ .26	**65**
66	**3/16 & 5/16**	$3\frac{3}{8}$		.13	.20	.26	**66**
67	**1/4 & 5/16**	4	$\frac{1}{4}$ & $\frac{5}{16}$	.15	.23	.30	**67**
68	**1/4 & 3/8**	4		.15	.23	.30	**68**
69	**5/16 & 3/8**	5	$\frac{5}{16}$ & $\frac{11}{32}$	.18	.27	.36	**69**
70	**5/16 & 7/16**	5		.18	.27	.36	**70**
71	**3/8 & 7/16**	$5\frac{7}{8}$	$\frac{11}{32}$ & $\frac{3}{8}$	.22	.33	.44	**71**
72	**3/8 & 1/2**	$5\frac{7}{8}$		.22	.33	.44	**72**
73	**7/16 & 1/2**	$6\frac{5}{8}$	$\frac{3}{8}$ & $\frac{7}{16}$	.27	.41	.54	**73**
74	**7/16 & 9/16**	$6\frac{5}{8}$		.27	.41	.54	**74**
75	**1/2 & 9/16**	$7\frac{1}{2}$	$\frac{7}{16}$ & $\frac{1}{2}$	.33	.50	.66	**75**
76	**1/2 & 5/8**	$7\frac{1}{2}$		.33	.50	.66	**76**
77	**9/16 & 5/8**	$8\frac{3}{8}$	$\frac{1}{2}$ & $\frac{9}{16}$	.40	.60	.80	**77**
78	**9/16 & 3/4**	$8\frac{3}{8}$		.40	.60	.80	**78**
79	**5/8 & 3/4**	10	$\frac{9}{16}$ & $\frac{5}{8}$	.48	.72	.96	**79**
80	**5/8 & 7/8**	10		.48	.72	.96	**80**
81	**3/4 & 7/8**	$11\frac{3}{8}$	$\frac{5}{8}$ & $\frac{11}{16}$	.58	.87	1.16	**81**
82	**3/4 & 1**	$11\frac{3}{8}$		.58	.87	1.16	**82**
83	**7/8 & 1**	$12\frac{5}{8}$	$\frac{11}{16}$ & $\frac{3}{4}$	.68	1.02	1.36	**83**
84	**7/8 & 1 1/8**	$12\frac{5}{8}$		.68	1.02	1.36	**84**

S WRENCHES

For Nuts, Set-Screws and Cap-Screws



These Wrench Forgings are made in **nine (9) sizes;** viz.: Numbers 235, 240, 246, 251, 255, 263, 274, 281 and 288 but each is milled and finished to several combinations. (See list.)

They will be milled to Metric Measure, International Standard or to special sizes when required. A sample nut or screw for use as gauge should accompany orders for specially milled wrenches.

The unfinished, plain forgings (not milled) have openings from $\frac{1}{32}$ to $\frac{1}{8}$ inch smaller than the finished sizes.

See on page 9 the conditions in which they are furnished.

When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired.

Prices given for special wrenches upon receipt of models or drawings and on learning quantity required.

For other S Wrenches, see page 35.

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nuts; Size Bolts	For Set-Screws; Sizes	For Square Hd. Cap-Screws; Diam. Screws	For Hex. Hd. Cap-Screws; Diam. Screws	Openings Finished	Extreme Lgth.	Thickness Heads	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
235		**1/4 & 5/16**			$\frac{1}{4}$ & $\frac{5}{16}$	$3\frac{5}{8}$	$\frac{1}{4}$ & $\frac{9}{32}$	$.10	$.15	$.20	**235**
236		**1/4 & 3/8**			$\frac{1}{4}$ & $\frac{3}{8}$			.10	.15	.20	**236**
237		**1/4 & 7/16**			$\frac{1}{4}$ & $\frac{7}{16}$			.10	.15	.20	**237**
238		**5/16 & 3/8**			$\frac{5}{16}$ & $\frac{3}{8}$			.10	.15	.20	**238**
239	**1/8 & 3/16**				$\frac{5}{16}$ & $\frac{13}{32}$			.10	.15	.20	**239**

240		5/16 & 7/16			5/16 & 7/16	47/8	3/32 & 5/16	$.12	$.18	$.24	240
241	1/8 & 1/4				5/16 & 1/2			.12	.18	.24	241
242		3/8 & 7/16	1/4 & 5/16	3/16 & 1/4	3/8 & 7/16			.12	.18	.24	242
243	3/16 & 1/4				13/32 & 1/2			.12	.18	.24	243
244	3/16 & 5/16				13/32 & 9/32			.12	.18	.24	244
245	1/4 & 5/16				1/2 & 9/32			.12	.18	.24	245
246		3/8 & 1/2	1/4 & 3/8	3/16 & 5/16	3/8 & 9/16	53/4	5/16 & 11/32	.15	.22	.30	246
247		3/8 & 9/16	1/4 & 7/16	3/16 & 3/8	3/8 & 5/8			.15	.22	.30	247
248		7/16 & 1/2	5/16 & 3/8	1/4 & 5/16	7/16 & 1/2			.15	.22	.30	248
249		7/16 & 9/16	5/16 & 7/16	1/4 & 3/8	7/16 & 9/16			.15	.22	.30	249
250	1/4 & 3/8				9/16 & 5/8			.15	.22	.30	250
251		1/2 & 9/16	3/8 & 7/16	5/16 & 3/8	9/16 & 5/8	61/2	3/8 & 13/32	.19	.28	.38	251
252		1/2 & 5/8	3/8 & 1/2	5/16 & 7/16	5/8 & 11/16			.19	.28	.38	252
253	5/16 & 3/8				11/16 & 3/4			.19	.28	.38	253
254	5/16 & 7/16				11/16 & 25/32			.19	.28	.38	254
255			3/8 & 9/16		3/4 & 13/16	71/4	13/32 & 7/16	.24	.36	.48	255
256		1/2 & 3/4		5/16 & 1/2	13/16 & 7/8			.24	.36	.48	256
257		9/16 & 5/8	7/16 & 1/2	3/8 & 7/16	15/16 & 1			.24	.36	.48	257
258			7/16 & 9/16		1 & 1 1/16			.24	.36	.48	258
259		9/16 & 3/4	7/16 & 5/8	3/8 & 1/2	1 & 1 1/16			.24	.36	.48	259
260			1/2 & 9/16		1 1/16 & 1 1/8			.24	.36	.48	260
261	3/8 & 7/16				1 1/16 & 1 5/32			.24	.36	.48	261
262	3/8 & 1/2				1 1/16 & 1 7/32			.24	.36	.48	262
263		5/8 & 3/4	1/2 & 5/8	7/16 & 1/2	1 1/16 & 1 1/8	8	1/2 & 17/32	.30	.45	.60	263
264				7/16 & 9/16	1 1/8 & 1 3/16			.30	.45	.60	264
265		5/8 & 7/8	1/2 & 3/4		1 1/8 & 1 7/32			.30	.45	.60	265
266			9/16 & 5/8		1 1/16 & 1 1/4			.30	.45	.60	266
267			9/16 & 3/4		1 1/16 & 1 7/32			.30	.45	.60	267
268				1/2 & 9/16	1 1/8 & 1 3/16			.30	.45	.60	268
269		3/4 & 7/8	5/8 & 3/4	1/2 & 5/8	1 1/8 & 1 7/32			.30	.45	.60	269
270	7/16 & 1/2				1 1/4 & 1 7/32			.30	.45	.60	270
271	7/16 & 9/16				1 25/32 & 1 31/32			.30	.45	.60	271

For additional sizes see following page.

S WRENCHES—Continued

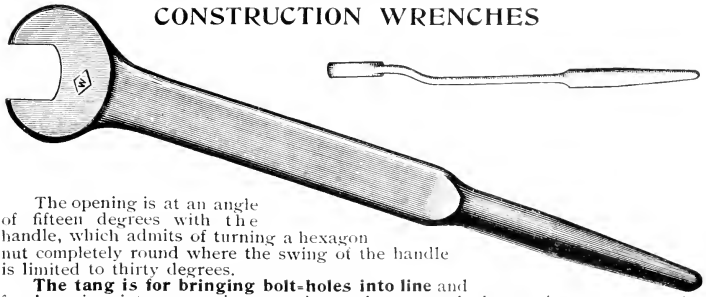
Please use numbers when ordering

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nuts; Size Bolts	For Set Screws; Sizes	For Square Hd. Cap-Screws; Diam. Screws	For Hex. Hd. Cap-Screws; Diam. Screws	Openings Finished	Extreme L'gth	Thickness Heads	Price, Unfinished	Price, Semi-finished	Price, finished	Number
272	1/2 & 9/16				7/8 & 31/32			.30	.45	.60	272
273	1/2 & 5/8				7/8 & 1 1/16			.30	.45	.60	273
274		3/4 & 1		1/2 & 3/4	3/4 & 1	10	17/32 & 9/16	.38	.57	.76	274
275				9/16 & 5/8	13/16 & 7/8			.38	.57	.76	275
276				9/16 & 3/4	13/16 & 1			.38	.57	.76	276
277		7/8 & 1		5/8 & 3/4	7/8 & 1			.38	.57	.76	277
278	9/16 & 5/8				31/32 & 1 1/16			.38	.57	.76	278
279	9/16 & 3/4				31/32 & 1 1/16			.38	.57	.76	279
280	5/8 & 3/4				1 1/16 & 1 1/16			.38	.57	.76	280
281		7/8 & 1 1/8	3/4 & 7/8	5/8 & 7/8	7/8 & 1 1/8	11 1/2	5/8 & 11/16	.49	.74	.98	281
282		1 & 1 1/8		3/4 & 7/8	1 & 1 1/8			.49	.74	.98	282
283		1 & 1 1/4		3/4 & 1	1 & 1 1/4			.49	.74	.98	283
284		1 1/8 & 1 1/4	7/8 & 1	7/8 & 1	1 1/8 & 1 1/4			.49	.74	.98	284
285	5/8 & 7/8				1 1/16 & 1 7/16			.49	.74	.98	285
286	3/4 & 7/8				1 1/4 & 1 7/16			.49	.74	.98	286
288			7/8 & 1 1/8	7/8 & 1 1/8	1 1/8 & 1 3/8	14 1/2	3/4 & 7/8	.65	.98	1.30	288
289			7/8 & 1 1/4	7/8 & 1 1/4	1 1/8 & 1 1/2			.65	.98	1.30	289
290			1 & 1 1/8	1 & 1 1/8	1 1/4 & 1 3/8			.65	.98	1.30	290
291			1 & 1 1/4	1 & 1 1/4	1 1/4 & 1 1/2			.65	.98	1.30	291
292			1 1/8 & 1 1/4	1 1/8 & 1 1/4	1 3/8 & 1 1/2			.65	.98	1.30	292
293	3/4 & 1				1 1/4 & 1 5/8			.65	.98	1.30	293
294	7/8 & 1				1 7/16 & 1 5/8			.65	.98	1.30	294
295	7/8 & 1 1/8				1 7/16 & 1 13/16			.65	.98	1.30	295

List prices are changed on numbers 274 to 286, inclusive; ignore all previous lists

CONSTRUCTION WRENCHES



The opening is at an angle of fifteen degrees with the handle, which admits of turning a hexagon nut completely round where the swing of the handle is limited to thirty degrees.

The tang is for bringing bolt-holes into line and for insertion into convenient openings when wrench is not in use, preventing loss and keeping tool in sight. Handles will be offset, (see small cut) if desired, at an additional charge.

See on page 9 the conditions in which they are furnished.

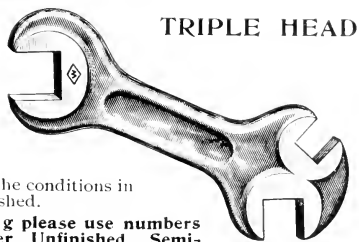
Milled to special sizes when required.

When ordering please use numbers and state whether Unfinished, Semi-finished or Finished Wrenches are desired

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nut; Size Bolt	Opening Finished	Extreme Length	Thickness Head	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
223	**3/8**	11/16	9	11/32	$ .20	$ .30	$ .40	**223**
225	**1/2**	7/8	11 1/2	1/16	.32	.48	.64	**225**
226	**9/16**	31/32	12 1/2	1/2	.40	.60	.80	**226**
227	**5/8**	1 1/16	14	9/16	.50	.75	1.00	**227**
228	**3/4**	1 1/4	16	5/8	.65	.97	1.30	**228**
229	**7/8**	1 7/16	17 1/2	11/16	.85	1.28	1.70	**229**
230	**1**	1 5/8	19	3/4	1.10	1.65	2.20	**230**

TRIPLE HEAD WRENCHES



See on page 9 the conditions in which they are furnished.

When ordering please use numbers and state whether Unfinished, Semi-finshed or Finished Wrenches are desired.

Unfinished Wrenches have Milled Openings

Number	For U. S. Standard Nuts; Size Bolts	For Set-Screws; Sizes	Extreme Length	Thickness Heads	Price, Unfinished	Price, Semi-finished	Price, Finished
464A	**5/16, 3/8, 1/2**		5 1/2	3/8	$ .28	$ .42	$ .56
B	**5/16, 7/16, 1/2**				.28	.42	.56
C	**3/8, 7/16, 1/2**				.28	.42	.56
D		**1/2, 5/8, 3/4**			.28	.42	.56
E		**9/16, 5/8, 3/4**			.28	.42	.56
465A	**7/16, 9/16, 1 1/8**		6 1/2	3/8	.45	.68	.90

PIN SPANNERS

UNFINISHED

Please use numbers when ordering

Number	For Circle; Size	Extreme Length	Pin will finish; Size	Price	Number
204	**1**	4	$\frac{3}{16}$	$ .18	**204**
205	**1 1/4**	$4\frac{1}{2}$	$\frac{13}{64}$	.19	**205**
206	**1 1/2**	5	$\frac{7}{32}$	.20	**206**
207	**1 3/4**	$5\frac{1}{2}$	$\frac{15}{64}$	.21	**207**
208	**2**	6	$\frac{1}{4}$	.22	**208**
209	**2 1/4**	$6\frac{1}{2}$	$\frac{17}{64}$	.23	**209**
210	**2 1/2**	7	$\frac{9}{32}$	.24	**210**
211	**2 3/4**	$7\frac{1}{2}$	$\frac{19}{64}$	.26	**211**
212	**3**	8	$\frac{5}{16}$	.28	**212**
213	**3 1/4**	$8\frac{1}{2}$	$\frac{21}{64}$	.30	**213**
214	**3 1/2**	9	$\frac{11}{32}$	.32	**214**
215	**3 3/4**	$9\frac{1}{2}$	$\frac{23}{64}$	.34	**215**
216	**4**	10	$\frac{3}{8}$	.36	**216**
218	**5**	12	$\frac{7}{16}$	.48	**218**
220	**6**	14	$\frac{1}{2}$	.65	**220**

LIGHT HOOK SPANNERS

UNFINISHED

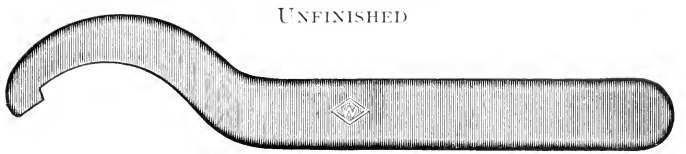
Please use numbers when ordering

Number	For Circle; Size	Extreme length	Price, Each	Number
310	**1 3/4**	$7\frac{1}{2}$	$ .14	**310**
311	**2 1/8**	8	.15	**311**
312	**2 1/2**	$8\frac{1}{4}$	.16	**312**
313	**2 3/4**	$8\frac{1}{2}$	.18	**313**
314	**3**	$8\frac{3}{4}$	.20	**314**
315	**3 1/2**	9	.22	**315**

Width of hook, $\frac{3}{16}$ in. Hook projects $\frac{1}{8}$ in.
Diameter of handle, all sizes, $\frac{3}{8}$ in. Width, face of curve, $\frac{3}{8}$ in.
Length of handle can be varied, if desired.

HOOK SPANNERS

UNFINISHED

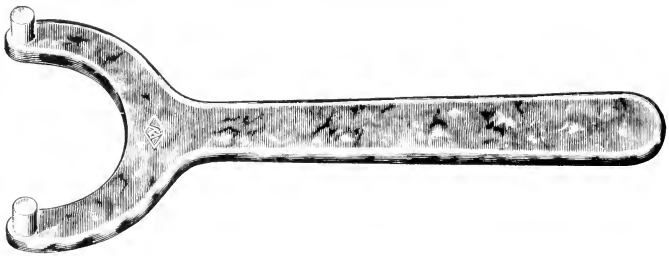


The diameter of circle which the unfinished forgings fit is given in second column of table but wrenches will finish to sizes stated in third column.

Please use numbers when ordering

Number	For Circle; Size	Forgings will finish for Circles; Size	Extreme length	Thickness	Price, Each	Number
403	**1 1/4**	1 to $1\frac{1}{4}$	$4\frac{3}{4}$	$\frac{7}{32}$	$ .20	**403**
404	**1 1/2**	$1\frac{3}{8}$ to $1\frac{5}{8}$	6	$\frac{1}{4}$	.23	**404**
405	**2**	$1\frac{3}{4}$ to 2	$7\frac{1}{8}$	$\frac{1}{4}$	.26	**405**
406	**2 1/4**	$2\frac{1}{8}$ to $2\frac{3}{8}$	$8\frac{7}{16}$	$\frac{1}{4}$	.30	**406**
407	**2 5/8**	$2\frac{1}{2}$ to $2\frac{3}{4}$	$9\frac{3}{4}$	$\frac{1}{4}$	.34	**407**
408	**3 1/8**	$2\frac{7}{8}$ to $3\frac{1}{4}$	$10\frac{7}{8}$	$\frac{5}{16}$	.40	**408**
409	**3 3/4**	$3\frac{3}{8}$ to $3\frac{7}{8}$	12	$\frac{5}{16}$	.48	**409**
410	**4 3/8**	4 to $4\frac{1}{2}$	13	$\frac{5}{16}$	.58	**410**

FACE SPANNERS



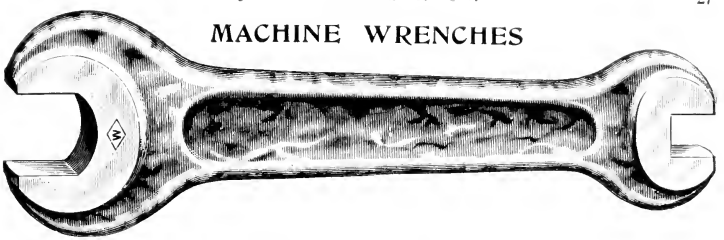
The Pins on these Spanners are forged integral with the Wrench, thus making the tools stronger and more durable than those of the ordinary type with inserted pins. They are regularly furnished with Pins milled to sizes given below, but will be supplied with Pins unfinished (not milled) if desired. Pins will be milled to special sizes at an extra charge. See on page 9 the conditions in which they are furnished.

When ordering please use numbers and state whether Unfinished (Pins Milled), Semi-finished or Finished are desired.

Number	Pins. Distance C to C	Pins. Finished Diam.	Length	Span of Jaws in Clear	L'gth from C. of Pins	Thickness	Price, Unfinished, (Pins Milled)	Price, Semi-finished	Price, Finished	Number
418	1	3/16	3/16	1 1/16	4 1/2	3/16	$ .15	$ .22	$ .33	**418**
420	1 1/4	7/32	7/32	1 3/32	5	3/16	.17	.24	.36	**420**
422	1 1/2	7/32	7/32	1 1/8	5 1/2	3/16	.19	.27	.39	**422**
424	1 3/4	7/32	7/32	1 3/8	6	7/32	.22	.30	.43	**424**
426	2	1/4	1/4	1 5/8	6 1/2	7/32	.25	.34	.47	**426**
428	2 1/4	1/4	1/4	1 7/8	7	7/32	.29	.38	.52	**428**
430	2 1/2	9/32	9/32	2 3/32	7 1/2	1/4	.33	.43	.57	**430**
432	2 3/4	9/32	9/32	2 11/32	8	1/4	.38	.48	.63	**432**
434	3	5/16	5/16	2 19/32	8 1/2	1/4	.43	.54	.70	**434**
436	3 1/4	5/16	5/16	2 13/16	9 1/8	1/4	.49	.60	.77	**436**
438	3 1/2	5/16	5/16	3 1/32	9 3/4	1/4	.55	.67	.85	**438**
440	3 3/4	3/8	3/8	3 1/4	10 3/8	1/4	.62	.75	.94	**440**
442	4	3/8	3/8	3 7/16	11	1/4	.70	.85	1.05	**442**

Larger sizes in preparation.

MACHINE WRENCHES



These are unusually heavy, being designed for use on Planers, Milling Machines, Lathes, Drill Presses, etc.

The Unfinished are sold in four (4) sizes; viz.: Numbers 395, 396, 397 and 398 but each can be milled to several combinations; see list.

Table gives sizes of openings for U. S. Standard Nuts and Set-screws only but each wrench admits of milling to several combinations of Hexagon and Square Head Cap-screws.

See on page 9 the conditions in which they are furnished.

Please use numbers when ordering, and state whether Unfinished, Semi-finished or Finished Wrenches are desired. Unfinished Wrenches have Milled Openings.

Number	Large Head for U. S. Standard Nuts; Size Bolt	Small Head for Set-screws; Size	Extreme Length	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
395 A	**3/8**	**3/8**	6½	$ .20	$.30	$ .40	**395**
B	**3/8**	**7/16**		.20	.30	.40	
C	**3/8**	**1/2**		.20	.30	.40	
D	**7/16**	**3/8**		.20	.30	.40	
E	**7/16**	**7/16**		.20	.30	.40	
F	**7/16**	**1/2**		.20	.30	.40	
396 A	**1/2**	**7/16**	7½	.25	.38	.50	**396**
B	**1/2**	**1/2**		.25	.38	.50	
C	**1/2**	**9/16**		.25	.38	.50	
D	**1/2**	**5/8**		.25	.38	.50	
E	**9/16**	**7/16**		.25	.38	.50	
F	**9/16**	**1/2**		.25	.38	.50	
G	**9/16**	**9/16**		.25	.38	.50	
H	**9/16**	**5/8**		.25	.38	.50	
397 A	**5/8**	**9/16**	8½	.30	.45	.60	**397**
B	**5/8**	**5/8**		.30	.45	.60	
C	**5/8**	**3/4**		.30	.45	.60	
398 A	**3/4**	**3/4**	10	.40	.60	.80	**398**
B	**3/4**	**7/8**		.40	.60	.80	
C	**3/4**	**1**		.40	.60	.80	
D	**7/8**	**3/4**		.40	.60	.80	
E	**7/8**	**7/8**		.40	.60	.80	
F	**7/8**	**1**		.40	.60	.80	

SINGLE HEAD SOCKET WRENCHES

With or Without Handle

These are adapted for Nuts, Set-Screws and Cap-Screws. They are designed for use either with another wrench which may be adjusted to the hexagon end of shank as a handle or with a Pin-handle (see table) which will be fitted to hexagon end of wrench at extra cost (see list).

The Openings are broached to U. S. Standard dimensions; Metric Measure, Whitworth or International Standard and special sizes furnished to order. In stock Unfinished only but with **openings broached.** Semi-finished and Finished to order when required.

The Handles are made of stiff, cold-rolled steel with ends nicely rounded.

When ordering please use numbers and state whether Wrenches are desired *with* or *without* handles; if not specified, they will be sent *without*.

See on page 9 the conditions in which they are furnished.

Special sizes and designs to order.
For other Single Head Socket Wrenches see page 61.

Number	HEXAGON OPENINGS: For U.S. Stand'rd Nuts; Size Bolts	HEXAGON OPENINGS: For Cap-Screws; Diam. Screws	HEXAGON OPENINGS: Short Diam. Finished Openings	SQUARE OPENINGS: For U.S. Stand'rd Nuts; Size Bolts	SQUARE OPENINGS: For Cap-Screws; Diam. Screws	SQUARE OPENINGS: For Set-Screws; Size	SQUARE OPENINGS: Short Diam. Finished Openings	Extreme Length	Diameter of Head	Diameter of Shank	Hex End; same size as U. S. Nut; for Size Bolt	Size of Pin-Handle: Diameter	Size of Pin-Handle: Length	Price with Opening Broached: Without Pin-Handle or Hole for same	Price with Opening Broached: With Pin-Handle and Hole for same
321 A	1/8		21/64			1/4	17/64	4	3/8	5/16	3/16	3/16	4	36 cts.	36 cts.
B														120	132

322	A		3/16	25/64				4 5/8	1 1/16	3/8	1/4	1/4	4 5/8	$ .23	$ .31
	B	3/16		27/64										.23	.31
	C		1/4	29/64										.23	.31
	D						5/16	21/64						.23	.31
323	A	1/4	5/16	33/64				5 3/16	3/4	7/16	5/16	5/16	5 1/2	.26	.36
	B					1/4	3/8	25/64						.26	.36
324	A		3/8	37/64				5 3/4	7/8	1/2	3/8	5/16	5 1/2	.31	.41
	B	5/16		39/64										.31	.41
	C					5/16	7/16	29/64						.31	.41
325	A		7/16	41/64				6 3/8	1 1/16	9/16	3/8	3/8	6 3/8	.36	.48
	B	3/8		43/64										.36	.48
	C		1/2	49/64										.36	.48
	D				1/4	3/8	1/2	33/64						.36	.48
	E					7/16	9/16	37/64						.36	.48
326	A	7/16		51/64				7 1/16	1 9/32	5/8	1/2	7/16	7 1/4	.43	.57
	B		9/16	53/64										.43	.57
	C	1/2	5/8	57/64										.43	.57
	D				5/16			39/64						.43	.57
	E					1/2	5/8	41/64						.43	.57
	F				3/8	9/16		45/64						.43	.57
327	A	9/16		63/64				7 5/8	1 1/2	1 1/16	9/16	1/2	8 1/8	.52	.68
	B		3/4	1 1/64										.52	.68
	C					5/8	3/4	49/64						.52	.68
	D				7/16			51/64						.52	.68
328	A	5/8		1 5/64				8 1/4	1 21/32	3/4	5/8	1/2	8 1/8	.64	.80
	B		7/8	1 5/32										.64	.80
	C				1/2	3/4	7/8	57/64						.64	.80
329	A	3/4	1	1 9/32				8 7/8	1 7/8	7/8	3/4	5/8	9	.78	1.00
	B				9/16			63/64						.78	1.00
	C						1	1 1/64						.78	1.00
	D				5/8			1 5/64						.78	1.00

For additional sizes see following page.

SINGLE HEAD SOCKET WRENCHES—Continued

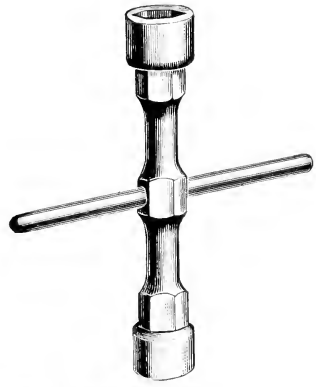
When ordering please use numbers and state whether Wrenches are desired *with* or *without* handles; if not specified they will be sent *without*.

Number	HEXAGON OPENINGS: For U.S. Stand'rd Nuts; Size Bolts	HEXAGON OPENINGS: For Cap-Screws; Diam. Screws	HEXAGON OPENINGS: Short Diam. Finished Openings	SQUARE OPENINGS: For U.S. Stand'rd Nuts; Size Bolts	SQUARE OPENINGS: For Cap-Screws; Diam. Screws	SQUARE OPENINGS: For Set-Screws; Size	SQUARE OPENINGS: Short Diam. Finished Openings	Extreme Length	Diameter of Head	Diameter of Shank	Hex End; same sizes as U.S. Nut; for Size Bolt	Size of Pin-Handle: Diameter	Size of Pin-Handle: Length	Price with Opening Broached: Without Pin-Handle or Hole for same	Price with Opening Broached: With Pin-Handle and Hole for same
330 A		1 1/8	1 13/32					9 3/4	2 3/16	1	7/8	11/16	10	$ .98	$1.27
B	7/8		1 15/32											.98	1.27
C		1 1/4	1 17/32											.98	1.27
D					7/8	1 1/8	1 5/32							.98	1.27
E				3/4	1	1 1/4	1 9/32							.98	1.27
331 A	1		1 21/32					10 5/8	2 1/2	1 1/8	1	3/4	11	1.28	1.64
B	1 1/8		1 27/32											1.28	1.64
C					1 1/8		1 13/32							1.28	1.64
D				7/8			1 15/32							1.28	1.64
332 A	1 1/4		2 1/32					11 1/2	2 13/16	1 1/4	1 1/4	7/8	12	1.96	2.46
B					1 1/4		1 17/32							1.96	2.46
C				1	1 3/8		1 21/32							1.96	2.46
333 A	1 3/8		2 7/32					12 1/2	3 3/8	1 3/8	1 1/2	1	13	2.80	3.44
B	1 1/2		2 13/32											2.80	3.44
C				1 1/8			1 27/32							2.80	3.44
D				1 1/4			2 1/32							2.80	3.44

For other Single Head Socket Wrenches see page 61.

DOUBLE HEAD SOCKET WRENCHES

With or Without Handle



These are designed for use either with another wrench which may be adjusted to the hexagon parts of shank as a handle or with a Pin-handle (see table), which will be fitted to central or end hexagon at extra cost (see list).

If desired, holes for Pin-handles will be drilled in the other hexagons at an additional charge.

Only openings of same shape are combined in list but one end can be broached hexagon and the other square if desired. Openings are broached to U. S. Standard dimensions; Metric Measure, Whitworth or International Standard and special sizes furnished to order. In stock **Unfinished** only but with openings broached. Semi-finished and Finished to order when required.

The Handles are made of stiff, cold-rolled steel with ends nicely rounded.

When ordering, please use numbers and state whether wrenches are desired *with* or *without* handles. If not specified, they will be sent *without*.

See on page 9 the conditions in which they are furnished.

Special sizes and designs to order.

Number	HEXAGON OPENINGS			SQUARE OPENINGS				Extreme Length	Diam. of Head.	Diam. of Shank	Hex. Parts of Shank; same size as U. S. Nut; for Size Bolt.	SIZE OF PIN-HANDLE. Diam.	Length	Price Without Pin-Handle or Hole	Price With Openings Broached for Pin-handle and Hole
	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws	Short Diam. Finished Openings	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws.	For Set-Screws; Sizes	Short Diam. Finished Openings								
340A	1 8 & 3 16		21/64 & 27/64					4 7/8	5/16 & 11/16	1/2	1/4	1/4	4 1/2	.28	.32
B						1 4 & 5 16	17/64 & 21/64							.32	.40
342A	1 8 & 1 4		21/64 & 33/64					6 1/4	3/8 & 7/16	1/2	1/16	5/16	5 1/2	.41	.54

For additional sizes see following page.

DOUBLE HEAD SOCKET WRENCHES—Continued

When ordering please use numbers and state whether wrenches are desired *with* or *without* handles. If not specified they will be sent *without*

Number	HEXAGON OPENINGS			SQUARE OPENINGS				Extreme Length.	Diam. of Head	Diam. of Shank	Hex. Parts of Shank; same size as U. S. Nut; for Size Bolt	SIZE OF PIN-HANDLE		PRICE WITH OPENINGS	
	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws	Short Diam. Finished Openings	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws	For Set-Screws; Sizes	Short Diam. Finished Openings					Diam.	Length	Without Pin-Handle or Hole	With Pin-Handle and Hole
342B	3/16 & 1/4		27/64 & 33/64											$.41	$.54
C		3/16 & 1/4	15/32 & 29/64											.44	.54
D		3/16 & 5/16	15/32 & 33/64											.44	.54
E		1/4 & 5/16	29/64 & 37/64											.44	.54
F			29/64 & 37/64			1/4 & 3/8	17/32 & 25/32							.44	.54
G						5/16 & 3/8	33/64 & 41/64							.44	.54
H	3/16 & 5/16		27/64 & 39/64											.44	.54
I	1/4 & 5/16		33/64 & 39/64											.44	.54
J		1/4 & 3/8	29/64 & 37/64											.44	.54
K		5/16 & 3/8	33/64 & 37/64											.44	.54
L						5/16 & 7/16	21/32 & 29/32							.44	.54
M					1/4 & 5/16	3/8 & 7/16	33/64 & 45/64							.44	.54
344A	1/4 & 3/8		33/64 & 45/64					7 3/4	1 1/8 & 1 9/32	5/8	1 1/2	7/8	7 1/2	.64	.78
B	5/16 & 3/8		37/64 & 45/64											.64	.78
C	5/16 & 7/16		37/64 & 49/64											.64	.78
D		5/16 & 7/16	37/64 & 49/64											.64	.78
E		3/8 & 7/16	41/64 & 49/64											.64	.78
F		3/8 & 1/2	45/64 & 53/64											.64	.78
G					1/4 & 3/8	3/8 & 1/2	25/32 & 33/64							.64	.78
H					5/16 & 3/8	7/16 & 1/2	29/32 & 33/64							.64	.78
I					5/16 & 7/16	7/16 & 9/16	29/32 & 37/64							.64	.78
J	3/8 & 7/16		45/64 & 53/64											.64	.78
K	3/8 & 1/2		45/64 & 57/64											.64	.78
L		7/16 & 9/16	49/64 & 57/64											.64	.78
M		7/16 & 5/8	53/64 & 61/64											.64	.78

| | | |

DOUBLE HEAD SOCKET WRENCHES—Continued

When ordering please use numbers and state whether wrenches are desired *with* or *without* handles. If not specified they will be sent *without*

Number	HEXAGON OPENINGS			SQUARE OPENINGS			Extreme Length	Diam. of Head	Diam. of Shank	Hex. Parts of Shank same Size as U. S. Nut for Size Bolt	HANDLE		Without Pin-Hole	With Pin-Hammer Dies and Hole
	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws	Short Diam. Finished Openings	For U. S. Standard Nuts; Size Bolts	For Cap-Screws; Diam. Screws	For Set-Screws; Sizes					Size of Pin	Length	Price	Price
348P				5 8 & 3 4									$1.60	$1.80
Q					5 8 & 7 8								1.60	1.80
R					3 4 & 7 8	7 8 & 1 1 8							1.60	1.80
S					3 4 & 1								1.60	1.80
T						1 8 & 1 1 8							1.60	1.80
U						1 8 & 1 1 4							1.60	1.80
350A	3 4 & 1					1 8 & 1 1 4	13¾	2⅞ & 2⅜	1¼	1¼		12	2.60	3.10
B	7 8 & 1												2.60	3.10
C		1 & 1 1 4											2.60	3.10
D		1 1 8 & 1 1 4											2.60	3.10
E				5 8 & 7 8									2.60	3.10
F				3 4 & 7 8									2.60	3.10
G					7 8 & 1								2.60	3.10
H					7 8 & 1 1 8								2.60	3.10
I					1 & 1 1 8								2.60	3.10
J						1 1 8 & 1 1 4							2.60	3.10
K	7 8 & 1 1 8												2.60	3.10
L	1 & 1 1 8												2.60	3.10
M	1 & 1 1 4												2.60	3.10
N	1 1 8 & 1 1 4												2.60	3.10
O				3 4 & 1									2.60	3.10
P				7 8 & 1									2.60	3.10
Q					1 & 1 1 4								2.60	3.10
R					1 1 8 & 1 1 4								2.60	3.10
S					1 1 8 & 1 3 8								2.60	3.10

TRACK WRENCHES

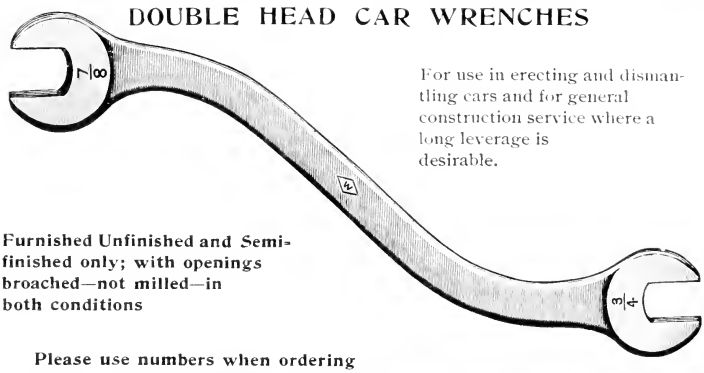
These are forged with round handles from stiff, strong steel that will not bend in use and are made any length down to 24 inches over all.

Furnished Unfinished and Semi-finished only; with openings broached—not milled—in both conditions

Please use numbers when ordering

Number	Outside Diameter of Nuts	Openings	Extreme Length	Thickness Head	Weight, Each	Price, Unfinished	Price, Semi-finished	Number
194	**1 1/4**	1 5/16	30	25/32	5 lbs. 5 oz.	$.60	$.90	**194**
195	**1 3/8**	1 7/16	30	13/16	5 lbs. 7 oz.	.60	.90	**195**
196	**1 1/2**	1 9/16	30	13/16	5 lbs. 9 oz.	.60	.90	**196**

DOUBLE HEAD CAR WRENCHES



For use in erecting and dismantling cars and for general construction service where a long leverage is desirable.

Furnished Unfinished and Semi-finished only; with openings broached—not milled—in both conditions

Please use numbers when ordering

Number	For U. S. Standard Nuts; Size Bolts	Openings	Extreme Length	Thickness Heads	Price, Unfinished	Price, Semi-finished	Number
370	**1/2 & 5/8**	15/16 & 1 1/8	19	1/2	$ .85	$1.28	**370**
371	**1/2 & 3/4**	15/16 & 1 5/16	19	1/2	.85	1.28	**371**
372	**1/2 & 7/8**	15/16 & 1 1/2	20	1/2	.92	1.38	**372**
373	**5/8 & 3/4**	1 1/8 & 1 5/16	20	1/2	.92	1.38	**373**
374	**5/8 & 7/8**	1 1/8 & 1 1/2	21	1/2	1.00	1.50	**374**
375	**5/8 & 1**	1 1/8 & 1 11/16	21	1/2	1.00	1.50	**375**
376	**3/4 & 7/8**	1 5/16 & 1 1/2	21	1/2	1.00	1.50	**376**
377	**3/4 & 1**	1 5/16 & 1 11/16	22	1/2	1.10	1.65	**377**
378	**3/4 & 1 1/8**	1 5/16 & 1 7/8	22	1/2	1.10	1.65	**378**
379	**7/8 & 1**	1 1/2 & 1 11/16	22	1/2	1.10	1.65	**379**
380	**7/8 & 1 1/8**	1 1/2 & 1 7/8	23	1/2	1.25	1.88	**380**
382	**1 & 1 1/8**	1 11/16 & 1 7/8	23	1/2	1.25	1.88	**382**

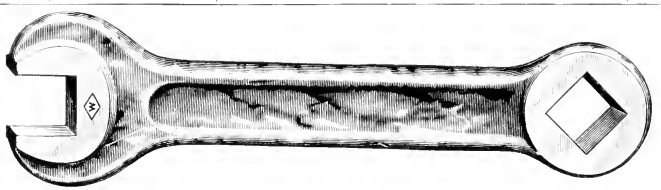
For other "S" Wrenches see pages 20 to 22.

DOUBLE HEAD TOOL POST WRENCHES

These can be milled a size larger than stated in table.
See on page 9 the conditions in which they are furnished.

Please use numbers when ordering.
Unfinished Wrenches have openings milled and holes broached.

Number	Open End for U. S. Standard Nuts; Size Bolt	Closed End for Set-Screws; Size	Extreme Length	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
124	**3/8**	**9/16**	6½	$ .30	$ .45	$ .60	**124**
129	**1/2**	**7/16**	7	.35	.52	.70	**129**
131	**1/2**	**9/16**	7	.35	.52	.70	**131**
132	**1/2**	**5/8**	7	.35	.52	.70	**132**
139	**5/8**	**5/8**	7½	.40	.60	.80	**139**
140	**5/8**	**3/4**	8	.45	.68	.90	**140**
143	**3/4**	**3/4**	9	.55	.82	1.10	**143**



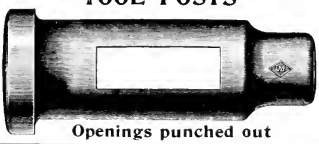
These can be milled a size larger than stated in table. The forgings for Nos. 154 and 158 are furnished in four other milled or finished combinations (Nos. 156, 157, 160 and 161) as stated in table.
See on page 9 the conditions in which they are furnished.

Please use numbers when ordering.
Unfinished Wrenches have openings milled and holes broached.

Number	Open End for Set-Screws; Size	Closed End for Set-Screws; Size	Extreme Length	Price, Unfinished	Price, Semi-finished	Price, Finished	Number
152	**7/16**	**7/16**	5½	$ .25	$ .37	$ .50	**152**
154	**1/2**	**1/2**	6	.27	.40	.54	**154**
156	**9/16**	**1/2**		.27	.40	.54	**156**
157	**9/16**	**9/16**		.27	.40	.54	**157**
158	**5/8**	**5/8**	6¾	.32	.48	.64	**158**
160	**11/16**	**5/8**		.32	.48	.64	**160**
161	**11/16**	**11/16**		.32	.48	.64	**161**
162	**3/4**	**3/4**	7½	.40	.60	.80	**162**

TOOL POST FITTINGS—Unfinished

TOOL POSTS



Openings punched out

Number	0	2	3	4	5	7
Extreme Length	$4\frac{1}{16}$	$4\frac{9}{16}$	$5\frac{1}{4}$	$6\frac{5}{16}$	$7\frac{3}{8}$	$8\frac{3}{4}$
Diameter of Body	$1\frac{1}{4}$	$1\frac{5}{8}$	$1\frac{13}{16}$	$2\frac{1}{16}$	$2\frac{1}{4}$	$2\frac{31}{32}$
Length of Body	$2\frac{7}{8}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{3}{8}$	5	6
Diameter of Base	$1\frac{5}{8}$	$2\frac{1}{8}$	$2\frac{5}{16}$	$2\frac{5}{8}$	$2\frac{15}{16}$	$3\frac{19}{32}$
Thickness of Base	$\frac{1}{4}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{3}{4}$
Distance Base to Opening	$\frac{1}{2}$	$\frac{13}{16}$	$\frac{15}{16}$	$1\frac{3}{16}$	$1\frac{3}{8}$	$1\frac{1}{2}$
Size of Opening	$1\frac{15}{16}$x$\frac{19}{32}$	$1\frac{7}{8}$x$\frac{11}{16}$	$2\frac{1}{8}$x$\frac{3}{4}$	$2\frac{1}{8}$x$\frac{7}{8}$	3x$\frac{15}{16}$	$3\frac{9}{16}$x1
Price, each	$ .30	.45	.60	.80	1.00	2.00

TOOL POST WEDGES

For Changing Angles of Lathe Tools

Number	0	1	1 1/2	2	3	4	6
Length	3	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{7}{8}$	$4\frac{3}{8}$	$4\frac{7}{8}$	$5\frac{1}{4}$
Width	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{15}{16}$
Radius	$2\frac{7}{8}$	$4\frac{5}{8}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6
Price, each	$ .07	.09	.09	.10	.12	.14	.18

TOOL POST RINGS

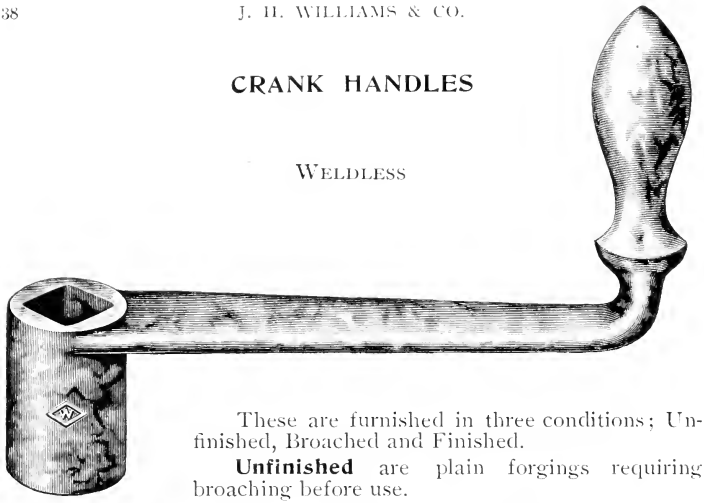
For Changing Angles of Lathe Tools

Number	0	1	2	3	4	6
Diameter, Outside	$2\frac{15}{16}$	3	$3\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Diameter, Hole	$1\frac{5}{16}$	$1\frac{5}{8}$	$1\frac{3}{4}$	2	2	$2\frac{3}{16}$
Thickness, Outside Edge	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{9}{16}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
Radius of Concave	$2\frac{7}{8}$	$4\frac{5}{8}$	$4\frac{3}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6
Price, each	$ .14	.15	.20	.22	.27	.33

Please use numbers when ordering

CRANK HANDLES

WELDLESS



These are furnished in three conditions; Unfinished, Broached and Finished.

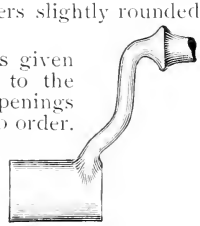
Unfinished are plain forgings requiring broaching before use.

Broached have hubs broached but are otherwise plain forgings.

Finished are broached, ground, polished, case-hardened all over and lacquered to prevent rusting.

The broached openings are made with corners slightly rounded to prevent breakage.

Holes are regularly finished to standard sizes given below but each forging admits of broaching to the maximum dimensions stated in table. Smaller openings than standard and special sizes will be broached to order.



Hubs of Broached or Finished will be cut to shorter lengths and Handles will be offset (see cut) if desired, at an additional charge.

When ordering please use numbers and state whether Unfinished, Broached or Finished are desired.

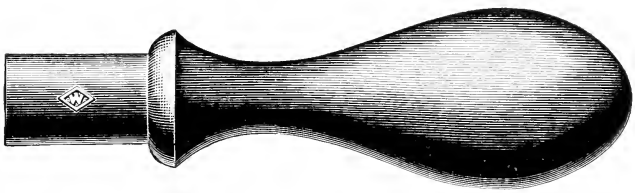
Number	Length over all	Length Center to Center	Length Handle above Arm	Length, Hub	Diameter Hub	Size Hole Broached: Standard in Stock	Size Hole Broached: Maximum to Order	Price, Unfinished	Price, Broached	Price, Finished	Number
2	4 1/2	3 1/2	2 7/8	1 5/16	1	1/2	9/16	$ .50	$ .75	$1.00	**2**
4	5 1/8	4	3 1/8	1 5/16	1 1/4	9/16	3/4	.60	.85	1.20	**4**
6	6 1/8	5	3 5/16	1 5/16	1 1/4	5/8	3/4	.75	1.00	1.50	**6**
8	7 1/8	6	3 1/4	1 5/16	1 1/4	11/16	3/4	.95	1.25	1.90	**8**
10	8 1/4	7	3 7/16	2	1 3/8	3/4	13/16	1.20	1.50	2.40	**10**
12	9 3/8	8	3 5/8	2 7/16	1 1/2	7/8	15/16	1.50	1.80	3.00	**12**
14	10 1/2	9 1/8	3 5/8	2 1/2	1 1/2	7/8	15/16	1.70	2.00	3.40	**14**
16	11 1/2	10	4	3	1 3/4	1	1 1/8	2.25	2.60	4.50	**16**

Smaller sizes in preparation.

MACHINE HANDLE FORGINGS

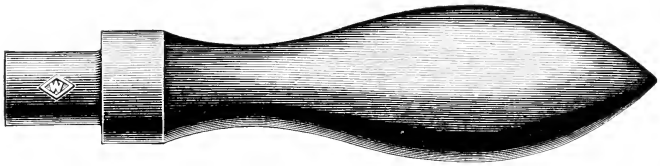
UNFINISHED

Ball Pattern



Number	00	0	1	2	3	4	5	6	7
Length, over all	2	2 1/1	2 5/8	3 1/1	3 7/8	4 1/2	5 1/8	5 3/4	6 5/8
Standard L'th, Shank	1/2	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2
Maximum L'th, Shank	1 1/16	3/4	1	1 1/8	1 1/1	1 1/2	1 7/8	2	2 1/8
Diam. Shank	5/16	11/32	13/32	15/32	15/32	17/32	19/32	11/16	3/4
Price, each	$ .04	.05	.06	.08	.10	.12	.14	.16	.22

Cone Pattern



Number	11	13	15	16
Length, over all	3 3/8	4 1/2	5 1/2	6
Standard L'th, Shank	1/2	3/4	7/8	1 1/8
Maximum L'th, Shank	1 1/16	1 1/8	1 3/8	1 1/2
Diam. Shank	3/8	7/16	1/2	9/16
Price, each	$ .06	.10	.14	.16

Please use numbers when ordering

DROP-FORGED LATHE DOGS

With Bent Tail

These are superior to any in the market, for the following reasons:

They are drop-forged from steel, which gives the greatest strength and toughness of material for the least weight, while they are also heavier than dogs of corresponding sizes made elsewhere.

The cross section is shaped similarly to an ogee, forming a rib on the edge, by which the metal is utilized to its greatest advantage at the point of severest strain.

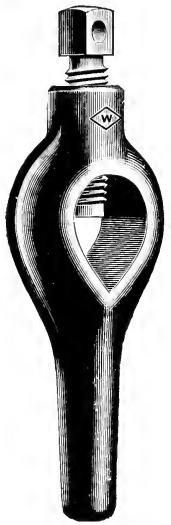
The steel screws have U. S. Standard threads, the points are hardened and they are from one-sixteenth to one-eighth of an inch larger in diameter than those generally used in Lathe Dogs.

Please use numbers when ordering

Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Size Dog	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3	3 1/2	4	5
Price, each	$ .50	.60	.70	.80	.95	1.10	1.25	1.40	1.60	1.80	2.00	2.30	4.00
Diam. Screw	5/16	3/8	7/16	1/2	1/2	9/16	5/8	11/16	11/16	3/4	7/8	7/8	1
Length Screw	1 1/8	1 1/4	1 5/8	2	2 1/4	2 3/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4 1/2
Extra Screws, each	$ .05	.06	.07	.08	.09	.10	.12	.18	.20	.22	.33	35	.50

DROP-FORGED LATHE DOGS

With Straight Tail



These are similar in design but are heavier than those with Bent Tail shown on previous page.

The cross section of the body is shaped similar to an ogee, forming a rib on the edge; that of the tail is an oval with the long axis in the direction of the thrust, thus utilizing the metal to the greatest advantage at the point of severest stress.

The heads are made of sufficient size to permit re-tapping for one or two larger sizes of screws as the threads wear.

The screws are the same as furnished with Bent Tail Dogs (see page 40), but have hole drilled in heads.

Please use numbers when ordering

Number	21	22	32	24	25	26	27	28	29	30	31	32	33
Size Dog	**3/8**	**1/2**	**3/4**	**1**	**1 1/4**	**1 1/2**	**1 3/4**	**2**	**2 1/2**	**3**	**3 1/2**	**4**	**5**
Price, each	**$ .30**	**.35**	**.40**	**.45**	**.55**	**.65**	**.80**	**1.05**	**1.30**	**1.65**	**2.00**	**2.30**	**4.00**
Diam. Screw	5/16	3/8	7/16	1/2	1/2	9/16	5/8	11/16	11/16	3/4	7/8	7/8	1
Length Screw	1 1/8	1 1/4	1 5/8	2	2 1/4	2 3/8	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4 1/2
Size Hole in Head of Screw	5/32	3/16	7/32	1/4	1/4	1/4	5/16	5/16	5/16	3/8	7/16	7/16	1/2
Extra Screws, each	$ .05	.06	.07	.08	.09	.10	.12	.18	.20	.22	.33	.35	.50

VULCAN HOIST HOOKS

With Shank

These have the greatest strength and stiffness with the least weight: their dimensions and form are the results of long and careful experimenting. They are forged from a fine steel, which is utilized to greatest advantage at the point of severest stress. The shanks are designed to sustain a far heavier load than is required to straighten the hooks and the strength of the hooks throughout is much greater than the stated safe capacity: see table of tests on following page.

Full size drawings will be sent on request.

Tobin Bronze Hooks, from standard or special dies, to order in quantities; prices on application.

List prices are reduced on numbers 7 to 13 inclusive: ignore all previous lists.

Please use numbers when ordering

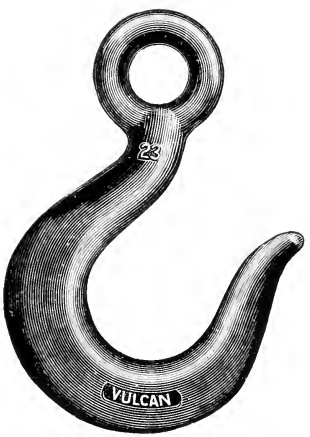
Number	For Size Hoist; Tons	Shank		Extreme Dimensions		Safe Capacity; Tons	Price, each	Number
		Diam.	Length	Length	Width			
2	**1/8**	$\frac{1}{2}$	$1\frac{1}{4}$	$4\frac{1}{4}$	$2\frac{7}{8}$	1	$.15	**2**
3	**1/4**	$\frac{9}{16}$	$1\frac{1}{2}$	$4\frac{3}{4}$	$3\frac{1}{8}$	$1\frac{1}{2}$	.18	**3**
4	**1/2**	$\frac{5}{8}$	$1\frac{3}{4}$	$5\frac{1}{4}$	$3\frac{1}{2}$	2	.21	**4**
5	**3/4**	$\frac{3}{4}$	2	6	$3\frac{7}{8}$	3	.27	**5**
6	**1**	$\frac{7}{8}$	$2\frac{1}{4}$	$6\frac{3}{4}$	$4\frac{3}{8}$	4	.36	**6**
7	**1 1/2**	1	$2\frac{1}{2}$	$7\frac{1}{2}$	$4\frac{7}{8}$	5	.50	**7**
8	**1 3/4**	$1\frac{1}{8}$	$2\frac{3}{4}$	$8\frac{1}{2}$	$5\frac{5}{8}$	6	.70	**8**
9	**2**	$1\frac{1}{4}$	3	$9\frac{1}{2}$	$6\frac{3}{4}$	7	.95	**9**
10	**2 1/2**	$1\frac{3}{8}$	$3\frac{1}{4}$	$10\frac{1}{4}$	$6\frac{7}{8}$	8	1.25	**10**
11	**3**	$1\frac{1}{2}$	$3\frac{1}{2}$	$11\frac{1}{8}$	$7\frac{1}{2}$	10	1.65	**11**
12	**4**	$1\frac{5}{8}$	4	$12\frac{1}{2}$	$8\frac{1}{4}$	12	2.15	**12**
13	**5**	$1\frac{3}{4}$	$4\frac{1}{2}$	$13\frac{7}{8}$	$9\frac{1}{4}$	15	2.90	**13**
14	**6**	2	$5\frac{1}{8}$	$15\frac{5}{8}$	$10\frac{7}{8}$	18		**14**
15	**8**	$2\frac{3}{8}$	$5\frac{7}{8}$	$17\frac{3}{4}$	13	22		**15**

Shanks of Nos. 14 and 15 can be made longer if desired.

VULCAN HOIST HOOKS

With Eye

Weldless



These are the same, in all respects, as those with shank on opposite page, except that the bead is omitted and an eye substituted for the shank. The eye is designed to stand a much greater strain than is required to straighten the hook. See table of tests on following page.

Full size drawings will be sent on request.

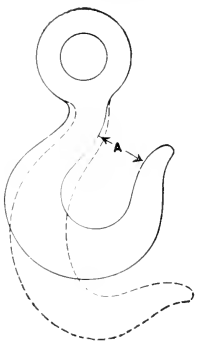
Tobin Bronze Hooks, from standard or special dies, to order in quantities; prices on application.

List prices are reduced on numbers 27 to 33, inclusive; ignore all previous lists.

Please use numbers when ordering

Number	For Size Hoist; Tons	Inside Diameter of Eye	Outside Diameter of Eye	Extreme Dimensions		Safe Capacity; Tons	Price, Each	Number
				Length	Width			
22	**1/8**	3/4	1 1/2	4 3/8	2 7/8	1	$ .15	**22**
23	**1/4**	7/8	1 3/4	4 7/8	3 1/8	1 1/2	.18	**23**
24	**1/2**	1	2	5 3/8	3 1/2	2	.21	**24**
25	**3/4**	1 1/8	2 1/4	6 1/8	3 7/8	3	.27	**25**
26	**1**	1 1/4	2 1/2	6 3/4	4 3/8	4	.36	**26**
27	**1 1/2**	1 3/8	2 3/4	7 5/8	4 7/8	5	.50	**27**
28	**1 3/4**	1 1/2	3	8 1/2	5 3/8	6	.70	**28**
29	**2**	1 5/8	3 1/4	9 1/2	6 3/8	7	.95	**29**
30	**2 1/2**	1 3/4	3 1/2	10 1/4	6 7/8	8	1.25	**30**
31	**3**	2	4	11 1/2	7 1/2	10	1.65	**31**
32	**4**	2 3/8	4 5/8	12 7/8	8 1/4	12	2.15	**32**
33	**5**	2 3/4	5 1/4	14 1/2	9 1/4	15	2.90	**33**
34	**6**	3 1/8	6 1/8	16 1/2	10 7/8	18		**34**
35	**8**	3 1/2	7	19	13	22		**35**

TESTS OF VULCAN HOIST HOOKS.

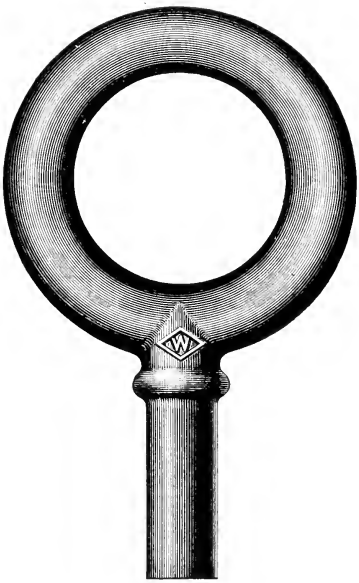


While we cannot guarantee the exact strength of any particular hook these goods have been often carefully tested by various parties to determine their strength. From the records kept of all these tests the **weakest** hook found of each size has been selected as the basis of the following table. The **average** strength is much greater than that stated. The cut shows at A the point at which the straightening was measured and the form of the hook when straightened out is indicated by dotted lines; none of the hooks broke under tests.

	Number of Hook	Strain Required to Stretch ¼ inch; lbs.	Strain Required to Stretch ½ inch; lbs.	Strain Required to Stretch ¾ inch; lbs.	Strain Required to Straighten out; lbs.	Number of Hook
With Shank	2	2,800	3,000	3,100	3,600	2
	3	3,200	3,500	3,700	4,300	3
	4	3,900	4,300	4,600	5,500	4
	5	6,500	7,900	9,100	13,800	5
	6	8,200	9,100	9,900	12,300	6
	7	9,800	11,600	13,100	19,100	7
	8	12,300	13,560	14,550	18,950	8
	9	15,850	17,830	19,200	27,060	9
	10	20,750	22,000	23,460	38,630	10
	11	20,700	23,550	29,440	42,800	11
	12	26,950	30,800	34,700	54,540	12
	13	28,140	32,650	36,600	67,900	13
	14	In Preparation.				14
	15					15
With Eye	22	2,700	3,100	3,500	4,050	22
	23	3,200	3,900	4,300	5,800	23
	24	4,000	4,900	5,600	7,600	24
	25	6,500	7,900	9,100	13,800	25
	26	9,400	10,800	11,600	13,100	26
	27	12,200	14,000	15,800	24,000	27
	28	12,300	13,560	14,550	18,950	28
	29	16,520	18,500	20,820	32,440	29
	30	20,750	22,000	23,460	38,630	30
	31	18,950	21,240	23,850	40,200	31
	32	26,900	30,700	33,500	53,950	32
	33	31,870	35,060	38,160	64,100	33
	34	In Preparation.				34
	35					35

EYE-BOLTS

Weldless



These are drop-forged from a stiff, strong steel, which careful tests have proved to be the best for the purpose. The metal in the heads is so distributed as to utilize it to the greatest advantage at the point of severest stress.

Prices given for special Eye-bolts on receipt of drawings or models and specifications.

Furnished without bead shown in cut, if preferred.

When ordering please state whether Blank or Threaded are desired. If not specified, Blank (shank not threaded) will be sent.

Threaded Eye-bolts of standard length are in stock; prices for these are for either U. S. or Whitworth Standard threads; special threads extra.

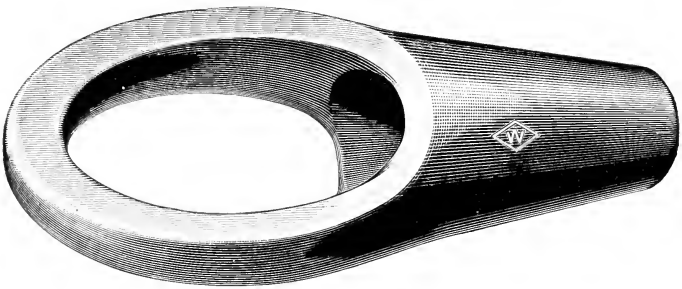
Tobin Bronze Eye-bolts for marine work from Standard or special dies to order in quantities. Prices on application.

Diam. Shank	Standard Length of Shank from Bead	Diam. Eye, Inside	Safe Capacity; Tons	Breaking Strain; Tons	Price, Each, Blank	Price, Each, Threaded	Price for Extra Length, per Inch or Fraction Thereof on Blanks	Diam. Shank
3/8	1	1 1/8	3/4	2 1/2	$ .11	$ .16	$ .02	**3/8**
7/16	1 1/8	1 3/16	1	3	.12	.17	.02	**7/16**
1/2	1 1/4	1 9/32	1 1/2	5	.14	.20	.03	**1/2**
9/16	1 1/2	1 3/8	2	6	.17	.24	.03	**9/16**
5/8	1 3/4	1 1/2	2 1/2	6	.22	.30	.04	**5/8**
3/4	2	1 11/16	3	8	.30	.40	.04	**3/4**
7/8	2 1/4	1 7/8	4	17	.40	.52	.05	**7/8**
1	2 1/2	2 1/16	5	22	.55	.69	.06	**1**
1 1/8	2 3/4	2 1/4	6	27	.80	.96	.07	**1 1/8**
1 1/4	3	2 7/16	7	33	1.10	1.29	.08	**1 1/4**
1 1/2	3 1/2	2 13/16	10	40	1.55	1.80	.10	**1 1/2**
1 3/4	3 3/4	3 1/8	15	47	2.15	2.50	.14	**1 3/4**
2	4	3 1/2	20	over 50	2.90	3.40	.18	**2**

For other Eye-bolts see page 53.

CLOSED WIRE-ROPE SOCKETS

Weldless



These are drop-forged from a fine grade of **steel** and are made **without welds;** they are, therefore, very much stronger, though lighter, than corresponding sizes of hand-forged, welded iron sockets.

Their design and proportions have been carefully studied to obtain the greatest possible strength with the least weight.

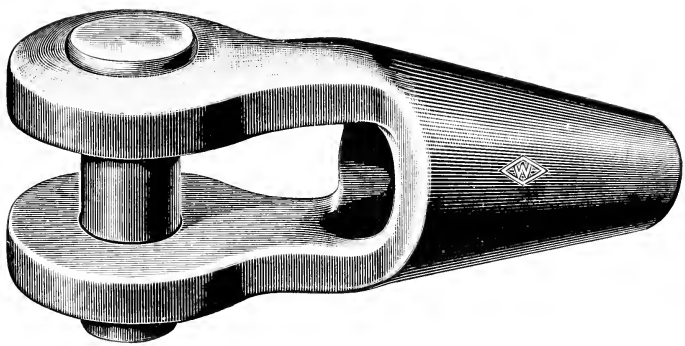
Furnished, regularly, with interior of the basket for holding rope serrated; smooth finish inside supplied to order.

When ordering, please use numbers and state whether serrated or smooth are desired. If not specified, serrated will be sent.

Number	4	5	6	7	8	9	10	11
Size Rope . . .	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Extreme Length	$4\frac{13}{16}$	$4\frac{13}{16}$	$5\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{3}{4}$	$7\frac{7}{8}$	$9\frac{1}{8}$	$10\frac{1}{4}$
Length Basket .	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Large Diameter Basket, Outside	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{1}{2}$
Small Diameter Basket, Outside	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{15}{16}$	$\frac{15}{16}$	$1\frac{1}{16}$	$1\frac{5}{16}$	$1\frac{7}{16}$	$1\frac{11}{16}$
Price, each . .	$.65	.65	.80	.80	1.00	1.25	1.55	1.95

OPEN WIRE-ROPE SOCKETS

Weldless



These are similar in design and proportions to the Closed Sockets shown on opposite page and are drop-forged, **without welds,** from a fine grade of **steel,** making them far superior in strength and finish to hand-forged, welded iron sockets.

The Pins are made of a superior grade of steel to obtain high shearing strength.

Furnished, regularly, complete with split-pin and with interior of basket for holding rope serrated; smooth finish inside supplied to order.

When ordering, please use numbers and state whether serrated or smooth are desired. If not specified, serrated will be sent.

Number	24	25	26	27	28	29	30	31
Size Rope . . .	**3/8**	**7/16**	**1/2**	**9/16**	**5/8**	**3/4**	**7/8**	**1**
Extreme Length	$4\frac{3}{16}$	$4\frac{3}{16}$	$5\frac{7}{16}$	$5\frac{7}{16}$	$6\frac{5}{8}$	$7\frac{7}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$
Length Basket	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Large Diameter Basket, Outside	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{8}$	$3\frac{1}{2}$
Small Diameter Basket, Outside	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{15}{16}$	$\frac{15}{16}$	$1\frac{1}{16}$	$1\frac{5}{16}$	$1\frac{7}{16}$	$1\frac{11}{16}$
Diameter Pin .	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Price, each . .	**$.80**	**.80**	**1.00**	**1.00**	**1.25**	**1.60**	**2.05**	**2.60**

CONNECTING RODS

UNFINISHED

For Gas Engines, Etc.

Full size drawings will be sent on request.

Prices will be given for Special Connecting Rods on receipt of models or drawings and specifications stating quantity required.

Dimensions show sizes of unfinished forgings.

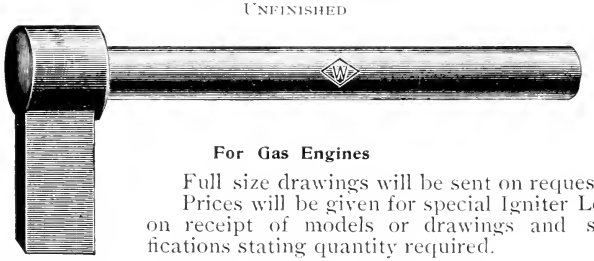
Please use numbers when ordering

Number	Length C to C	BOSSES OR HEADS — SMALL Diam.	SMALL Thick.	LARGE Diam.	LARGE Thick.	Thickness of Shank	Price	Number
*14A	5 15/16	1 13/32	3/4	1 13/32	3/4	7/16	$ .29	14A
21A	7 1/32	1 13/32	3/4	1 1/16	1	3/32	.32	21A
24A	7 1/2	1 13/32	3/4	1 5/16	1	5/16	.34	24A
35A	8 11/16	1 13/32	3/4	1 3/4	1 9/16	3/8	.60	35A

*Round shank ; heads flush with shank on one side, projecting 1/8 in. from shank on other side

IGNITER LEVERS

UNFINISHED



For Gas Engines

Full size drawings will be sent on request.

Prices will be given for special Igniter Levers on receipt of models or drawings and specifications stating quantity required.

Dimensions show sizes of unfinished forgings.

Please use numbers when ordering

Number	STEM Diam.	STEM Length under Shoulder	ARM OR LEVER Length from C. of Stem	ARM OR LEVER Width	ARM OR LEVER Thick.	ARM BOSS. Diam.	ARM BOSS. Length	Price	Number
6A	3/8	3 3/4	1 3/16	5/8	7/32	9/16	3/8	$ .12	6A
6B-Right	3/8	4	1 3/16	5/8	7/32	9/16	3/8	.12	6B-Right
6C-Left	3/8	4	1 3/16	5/8	7/32	9/16	3/8	.12	6C-Left
6D	3/8	4 3/4	1 3/16	5/8	7/32	9/16	3/8	.14	6D
8A	1/2	2 1/2	1	1	1/4	3/4	1/2	.12	8A
*10A	1/2	4 1/2	1 11/16	1 5/8	1/4	3/4	1/2	.31	10A
10B	1/2	5 5/16	1 1/4	1	1/4	3/4	1/2	.22	10B
12A-Right	5/8	3 1/2	1 3/16	5/8	5/16	1	5/8	.18	12A-Right
12B-Left	5/8	3 1/16	1 3/16	5/8	5/16	1	5/8	.18	12B-Left

*Double arms projecting both sides of stem in form of T.

ROD ENDS

UNFINISHED

These Rod or Stub Ends are drop-forged from mild steel that welds easily. They are of service in general shop use or machine manufacture as ends of Connecting Rods, Oscillating Bars, Shifting Levers, Eccentric Connections, Yoke Heads, etc., etc.

Prices will be given for special forms on receipt of models or drawings and specifications stating quantity required.

Dimensions show sizes of unfinished forgings.

List prices are changed; ignore all previous lists.

Please use numbers when ordering

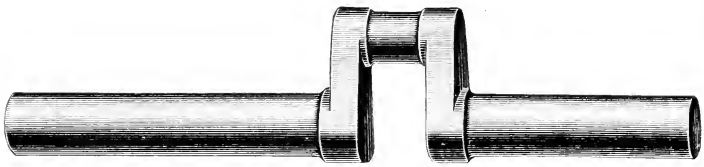
Number	SHANK		HEAD		Price, Each	Number
	Diameter	Length under Head	Diameter	Thickness		
2-A	**5/16**	$3\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{16}$	$ .06	**2-A**
***3-A**	**3/8**	2	1	$\frac{3}{8}$	.06	***3-A**
5-A	**1/2**	$4\frac{3}{8}$	1	$\frac{1}{2}$	.11	**5-A**
†**5-B**	**1/2**	$2\frac{3}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	.08	†**5-B**
6-A	**9/16**	2	$1\frac{1}{16}$	$\frac{7}{16}$	.08	**6-A**
7-A	**5/8**	$2\frac{3}{8}$	$1\frac{1}{8}$	$\frac{15}{32}$	.09	**7-A**
7-B	**5/8**	$4\frac{7}{8}$	$1\frac{1}{4}$	$\frac{19}{32}$	.14	**7-B**
7-C	**5/8**	$1\frac{1}{2}$	$1\frac{3}{4}$	$\frac{5}{8}$	.14	**7-C**
***7-D**	**5/8**	$7\frac{1}{2}$	$1\frac{5}{32}$	$\frac{21}{32}$	.18	***7-D**
***9-A**	**3/4**	$3\frac{7}{8}$	$1\frac{3}{4}$	$\frac{5}{8}$	.20	***9-A**
***14-A**	**1 1/16**	$5\frac{3}{4}$	$2\frac{1}{16}$	$1\frac{1}{8}$	.40	***14-A**

* Can be furnished longer if desired.

† Head off-set from center of shank $\frac{3}{64}$ inch.

CRANK SHAFTS

Unfinished and Weldless



Cut shows form of Nos. 25 and 40

These are drop-forged from stiff, strong steel and are made close to size, leaving a minimum amount of stock for finishing. Ends marked * on Nos. 10, 20 and 40 cannot be made longer than shown by table; all others can be drawn out to extra length at additional charge; see list.

Full size drawings sent on request.

Prices will be given for special Crank Shafts upon receipt of drawings and specifications.

Dimensions show sizes of unfinished forgings.

Single Throw Cranks

Number	Size of Shafts: Diam.	Size of Shafts: Lengths from Arm	Stroke of Piston	Diam. Wrist Pin	Distance Between Arms	Price, Each	Price for Extra Length, per inch or fraction thereof	Number
10	1 1/16	*2 1/8 & 8	**2**	1 1/16	1 7/16	$ .90	$ .06	**10**
20	1 3/16	*2 3/8 & 8 1/2	**3**	1 3/16	2 1/4	1.30	.07	**20**
25	1 1/4	8 1/2 & 8 1/2	**3 1/2**	1 1/8	1 1/2	1.75	.08	**25**
40	1 5/8	*8 1/2 & 10 1/2	**4 1/2**	1 3/8	1 3/4	2.90	.12	**40**
45	1 11/16	11 & 11	**6**	1 3/4	1 3/8	5.90	.13	**45**
46	1 3/4	11 1/2 & 11 1/2	**6**	1 5/8	2 7/16	4.75	.14	**46**
48	1 3/4	11 1/2 & 11 1/2	**6 1/2**	1 7/8	2 3/4	4.75	.14	**48**

Double Throw Cranks

30	1 3/8	9 & 9	**4**	1 1/2	1 7/16	4.00	.09	**30**
50	1 7/8	12 1/2 & 12 1/2	**5**	1 3/4	2 1/2	9.20	.16	**50**

See cut No. 30, page 67

List prices are changed; ignore all previous lists.

Please use numbers when ordering

PARTS FOR AUTOMOBILE STEERING GEAR

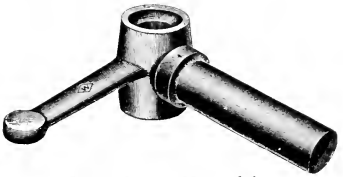
UNFINISHED

Suitable for carriages weighing from 600 to 1,500 pounds.

These parts are drop-forged from stiff, strong steel and are designed for use with ball bearings in pivot hub; they can be furnished for plain bearings in quantities to order.

Full size drawings sent on request.

Estimates given for special parts on receipt of models or drawings and specifications stating quantity required.



Steering Knuckle

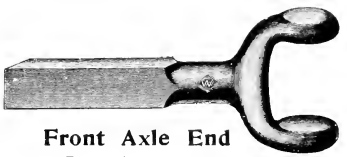
Price $2.00 each

	Inches		Inches
Length Axle from Shoulder	4 7/8	Length Lever C. to C.	6 1/2
Diameter of Axle	1 1/4	Length of Hub	3
Diameter of Shoulder	1 3/4	Diameter of Hub	1 3/4

Two other larger sizes Steering Knuckles furnished to order, viz:

	Inches		Inches
No. 5249, Length Axle from Shoulder,	10 1/4	No. 5850, Same general style as cut.	
Diameter of Axle,	2 1/4	Length Axle from Shoulder	9 1/4
		Diameter of Axle	2

No Axle Ends in Stock for Nos. 5249 and 5850; would be made to order in quantities.

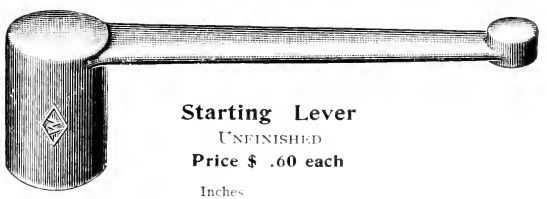


Front Axle End

Price $2.00 each

	Inches		Inches
Extreme Length	11 3/4	Distance between Arms	2 15/16
Length Round part of Axle	2	Length Square Part Axle	6
Diameter Round Part of Axle	1 5/16	Size Square Part Axle	1 5/16

If desired in quantities two Axle Ends will be furnished in one forging of any desired length, making a solid axle bed complete without welds.



Starting Lever

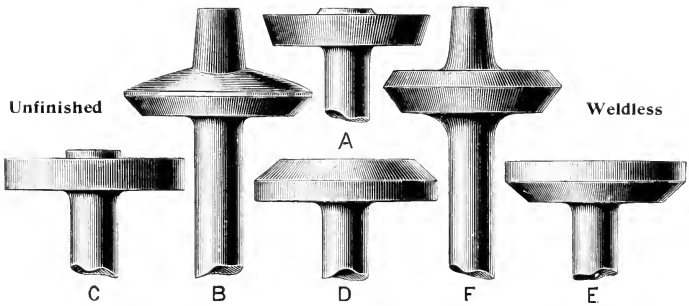
UNFINISHED

Price $ .60 each

	Inches		Inches
Extreme Length	9 1/16	Length C. to C.	7 7/8
Large Hub, Diam.	1 3/4	Small Hub, Diam.	7/8
" " Length	2 1/2	" " Length	1 7/32

See Crank Handles, page 38

VALVE-STEM FORGINGS



For Gas Engines, Etc. Dimensions show sizes of unfinished forgings. List prices are changed; ignore all previous lists.

Please use numbers when ordering

Type	Number	Head: Large Diam.	Head: Small Diam.	Head: Thickness	Stem: Diam.	Stem: Length	Lug on Head: Diam.	Lug on Head: Length	Price, Each	Price for Extra Length, per Inch or Fraction Thereof	Type	Number
A	2	1 1/4	1 1/8	5/32	5/16	6 1/2	5/16	5/16	$ .25	$ .01	A	2
	4	2 5/16	1 3/8	7/64	9/16	8 1/2	3/8	3/8	.40	.02		4
	6	2 5/16	1 3/4	7/64	9/16	8 1/2	3/8	3/32	.40	.03		6
	8	2 3/8	2 3/8	7/64	5/8	9	3/8	3/32	.45	.03		8
	9	2 3/4	2 1/16	1/16	5/8	9	3/8	3/32	.45	.03		9
	10	3 1/4	2 9/16	5/64	3/4	9 1/2	11/16	1/8	.55	.04		10
	11	3 7/8	3 1/8	5/64	3/4	10 1/2	3/4	1/4	.65	.04		11
B	1	1 1/4	1 1/4	5/64	5/16	6 1/2	5/16	5/16	.25	.01	B	1
	2	2 3/8	1 3/8	3/32	5/16	8 1/2	9/16	11/64	.40	.02		2
	4	2 3/8	2 3/8	7/64	5/8	9	11/16	15/64	.50	.03		4
	6	2 15/16	2 1/16	1/16	5/8	9 1/2	5/8	1	.50	.03		6
*	8	3	2 7/16	3/32	11/16	9 1/2	9/16	1	.50	.03	*	8
	10	3 5/8	3 1/16	3/32	11/16	10 1/2	11/16	15/16	.65	.04		10
	12	4 3/8	3 1/16	1/16	7/8	13	13/16	15/16	1.00	.05		12
	14	6 1/2	5 3/4	5/64	1 7/16	16	1	1	2.60	.09		14
C	0	7/8		1/8	1/4	5 1/2			.20	.01	C	0
	2	1 1/8		1/8	5/16	6 1/2	1/4	3/16	.25	.01		2
	4	1 13/16		5/32	3/8	7 1/2	5/16	5/16	.25	.01		4
	5	2 3/4		3/32	3/8	9	3/8	7/16	.50	.04		5
	6	2 13/16		1/16	7/16	9	3/8	3/32	.55	.05		6
	8	3 9/16		1/16	7/16	10 1/2	1/2	1/4	.80	.07		8
	10	4 1/16		1/32	1/2	10 1/2			.75	.05		10
	12	4 9/16		1/16	1/2	13			1.40	.07		12
	13	4 7/8		1/16	1 3/16	13			1.70	.09		13
	14	5 9/16		1/16	1 3/8	13	1 7/8	7/16	1.70	.09		14
D	2	2 1/4	1 1/16	1/16	1 3/8	16	1 7/8	1/2	2.20	.10		
	3	2 1/3	2 5/16	1/16	7/16	8 1/2			.45	.03	D	2
	4	2 5/16	2 5/16	1/16	7/16	9			.55	.05		3
	6	3 5/16	2 3/16	1/16	1/2	9			.65	.06		4
			2 3/4	5/64	1 1/16	9 1/2			.75	.06		6

*Head slightly recessed on Stem side.

Continued following page. For other valves, see page 61.

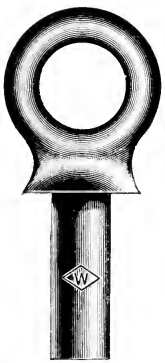
VALVE-STEM FORGINGS

UNFINISHED AND WELDLESS

See cuts on previous page.
Dimensions show sizes of unfinished forgings.
For other valves see page 61.
List prices are changed; ignore all previous lists.

Please use numbers when ordering

Type	Number	HEAD			STEM		LUG ON HEAD		Price, Each	Price for Extra Length per Inch or Fraction Thereof	Type	Number
		Large Diam.	Small Diam.	Thickness	Diam.	Length	Diam.	Length				
E	2	1 3/8	1 1/8	7/32	3/8	6 1/2			$ .25	$ .01	E	2
	3	1 5/8	1 3/8	1/4	7/16	7 1/2	7/16	3/16	.25	.02		3
	4	2 1/16	2 1/8	17/32	13/16	9			.50	.04		4
	6	3 9/16	3	5/8	1 1/16	10 1/2			.75	.06		6
	10	5 7/16	4 13/16	11/16	1 5/16	13			1.70	.08		10
F	2	1 15/16	1 5/8	11/32	7/16	7 1/2	7/16	7/8	.35	.02	F	2
	6	2 7/8	2 5/16	7/16	9/16	9	9/16	7/8	.45	.02		6
	7	2 7/8	2 1/16	11/16	11/16	9	11/16	1 5/16	.50	.03		7
	12	4 11/16	3 5/8	13/16	1	13	3/4	1 1/4	1.20	.06		12



A

MISCELLANEOUS EYE-BOLTS

WELDLESS

These are furnished in two styles or types, A and B. They are carried in stock with Shanks blank (not threaded), but will be supplied threaded to order. Full size drawings will be sent on request.

Please use numbers when ordering

B

Type	Number	SHANK		DIAM. EYE		Price, Each, Blank	Type	Number
		Diam.	Length	Inside	Outside			
A	15	1/2	2	9/16	1 1/4	$ .11	A	15
	25	5/8	1 3/4	7/8	1 5/8	.14		25
B	1	1/4	1/2	3/8	3/4	.05	B	1
	10	7/16	1 1/8	1	1 3/4	.11		10
	15	1/2	1 9/16	13/16	1 13/16	.12		15
	16	1/2	3 3/8	7/16	1 7/16	.12		16
	45	7/8	4 1/8	1 1/8	2 3/8	.35		45

For other Eye Bolts see page 45.

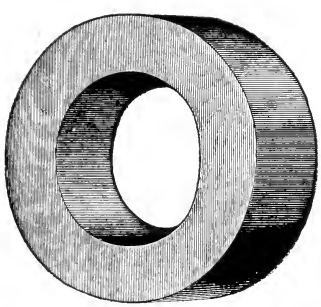
KEY FORGINGS

UNFINISHED

These are made from $\frac{1}{32}$ to $\frac{1}{16}$ inch wider than finished size, to allow for machining and are square without taper or draft on edges.

Cut to special length if desired. Taper $\frac{3}{16}$ inch to 1 foot.

Width, Finished Size	Standard Length under Head	Maximum Length under Head	Thickness under Head; Size Forgings	Price, per 100	Price per Extra Inch or Fraction Thereof, per 100	Width, Finished Size
3/16	$1\frac{1}{2}$	$3\frac{1}{2}$	$\frac{3}{16}$	$ 3.50	$ .90	**3/16**
1/4	2	$4\frac{1}{2}$	$\frac{1}{4}$	4.25	1.00	**1/4**
5/16	$2\frac{1}{2}$	$5\frac{1}{2}$	$\frac{9}{32}$	5.25	1.10	**5/16**
3/8	3	$6\frac{1}{2}$	$\frac{5}{16}$	6.50	1.25	**3/8**
7/16	$3\frac{1}{2}$	$7\frac{1}{2}$	$\frac{11}{32}$	7.75	1.40	**7/16**
1/2	4	$8\frac{1}{2}$	$\frac{7}{16}$	9.00	1.60	**1/2**
9/16	$4\frac{1}{2}$	9	$\frac{15}{32}$	10.50	1.80	**9/16**
5/8	5	9	$\frac{1}{2}$	12.00	2.05	**5/8**
11/16	$5\frac{1}{2}$	10	$\frac{9}{16}$	13.50	2.20	**11/16**
3/4	6	12	$\frac{5}{8}$	15.00	2.30	**3/4**
7/8	7	13	$\frac{11}{16}$	19.00	2.60	**7/8**
1	8	14	$\frac{3}{4}$	25.00	2.90	**1**
1 1/8	9	15	$\frac{13}{16}$	35.00	3.40	**1 1/8**
1 1/4	10	16	$\frac{7}{8}$	50.00	4.00	**1 1/4**



SHAFTING COLLARS OR BUSHINGS

UNFINISHED

Drop-forged from Steel

Weldless

Hole forged scant to allow for finishing

Size Shaft . .	**15/16**	$1\frac{3}{16}$	$1\frac{7}{16}$	$1\frac{11}{16}$	$1\frac{15}{16}$	$2\frac{3}{16}$	$2\frac{7}{16}$	$2\frac{11}{16}$	$2\frac{15}{16}$
Outside Diam.	$1\frac{13}{16}$	$2\frac{1}{16}$	$2\frac{7}{16}$	$2\frac{13}{16}$	$3\frac{3}{16}$	$3\frac{9}{16}$	$3\frac{13}{16}$	$4\frac{3}{16}$	$4\frac{9}{16}$
Width Face . .	$\frac{13}{16}$	$\frac{7}{8}$	1	$1\frac{1}{16}$	$1\frac{3}{16}$	$1\frac{5}{16}$	$1\frac{3}{8}$	$1\frac{7}{16}$	$1\frac{9}{16}$
Price, each . .	$ .09	.11	.14	.20	.26	.35	.44	.56	.70

For other rings see Ferrules, page 59

THUMB NUTS

Blank or Threaded
Threaded have base faced at right angle to hole
Tobin Bronze Thumb Nuts to order

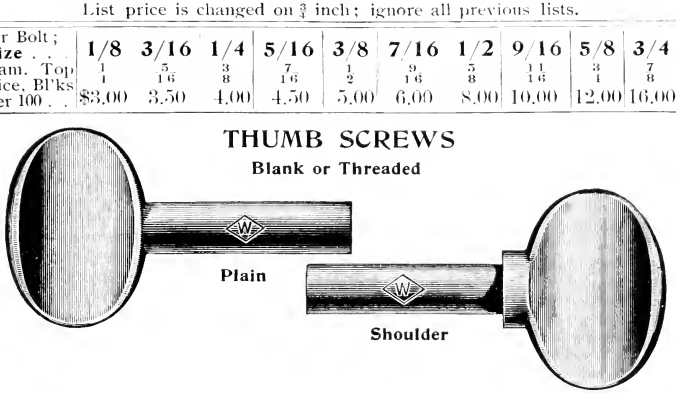
Threaded Thumb Nuts double following List Prices

List price is changed on $\frac{3}{4}$ inch; ignore all previous lists.

For Bolt; Size . .	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4
Diam. Top	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8
Price, Bl'ks per 100 . .	$3.00	3.50	4.00	4.50	5.00	6.00	8.00	10.00	12.00	16.00

THUMB SCREWS

Blank or Threaded



Drop-forged from steel which will harden slightly in water. Plain and shoulder are sold from same list. Please state when ordering which are desired; if not specified, plain will be sent. Special sizes and shapes and Tobin Bronze Thumb Screws to order. The threaded prices are for either U. S. or Whitworth Standard threads; special threads extra.

Price of Blanks per 100

Length under Head	Diameter									
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4
1/4	$1.40	$2.00	$2.50	$2.75	$3.00					
1/2	1.50	2.10	2.60	2.90	3.25	$4.25	$5.25	$6.25		
3/4	1.60	2.20	2.70	3.05	3.50	4.50	5.50	6.50		
1	1.70	2.30	2.80	3.20	3.75	4.75	5.75	6.75	$7.75	$10.00
1 1/4	1.80	2.40	2.90	3.35	4.00	5.00	6.00	7.00	8.00	10.25
1 1/2	1.90	2.50	3.00	3.50	4.25	5.25	6.25	7.25	8.25	10.50
1 3/4		2.60	3.10	3.65	4.50	5.50	6.50	7.50	8.50	10.75
2		2.70	3.20	3.80	4.75	5.75	6.75	7.75	8.75	11.00
2 1/4			3.30	3.95	5.00	6.00	7.00	8.00	9.00	11.50
2 1/2			3.40	4.10	5.25	6.25	7.25	8.25	9.50	12.00
2 3/4			3.50	4.25	5.50	6.50	7.50	8.50	9.75	12.25
3			3.60	4.40	5.75	6.75	7.75	8.75	10.00	12.50
3 1/2				4.70	6.25	7.25	8.25	9.25	10.50	13.00
4				5.00	6.75	7.75	8.75	9.75	11.00	13.50
4 1/2					7.25	8.25	9.25	10.25	11.50	14.00
5					7.75	8.75	9.75	10.75	12.00	14.50
5 1/2					8.25	9.25	10.25	11.25	12.50	15.00
6							10.75	11.75	13.00	15.50

Threaded Thumb Screws at double above List

For other Thumb Screws see page 61.

THE VULCAN PATENT DROP-FORGED CHAIN PIPE WRENCH

For Turning or Holding Pipe, Pipe-fittings, Bolts, Bars, Shafts, Etc., from 1/8 to 18 inches Diameter

With Cable Chain

With Flat Link Chain

Patented in the United States and England, October 27, 1896 and February 23, 1897; in Canada, 1896 and 1897. Trademark "Vulcan," registered in Great Britain, France, Germany, Russia, Austria-Hungary, Belgium, Denmark, Sweden and the U. S. A.

These wrenches combine the merits of all other chain pipe wrenches with special advantages of their own; they are strong and durable, being wholly from wrought steel. The drop-forged jaws are of saw temper; the teeth can be sharpened by filing only. The pressure of the teeth is in a line tangent to the circumference of the pipe, which, combined with the encircling grip of the chain, prevents crushing.

The Vulcan Wrench is sold with either cable or flat link chain, and is the only wrench adapted for both.

When ordering, say which chain is desired; flat link chain will be sent unless otherwise specified.

To change the chain, unscrew one cap-screw but remove neither jaw; slip out the internal pin on which the chain swings, thus releasing the chain; insert new chain, replace pin and cap-screw, screwing the latter **firmly** into place. Always keep the jaws screwed **tightly** to the handle.

The cable chains are of the finest quality; only the "D. B. G. Special Crane Chain" is used; each chain is hand formed and tested, link by link; each bears the trade mark (D B G) The flat link chains are hand made from steel made expressly for them and carefully tested in an Olsen testing machine.

The chain swings from the center and can be used on either side of the jaws, reducing the wear of the teeth to the minimum. Extra chains are supplied with swinging link and pin; extra jaws are supplied with one pair cap-screws. The handles are made from stiff, strong steel.

This wrench is equally efficient on fittings and straight pipe, in corners, against walls, between floors, in ditches or for overhead work. Each fits a range of sizes equal to six pairs of common tongs, and will outwear several pairs of any kind.

These tools are fully guaranteed and are recommended as the most efficient and economical chain pipe wrenches made. Nothing is spared in their manufacture that adds to their working and wearing qualities.

All parts are interchangeable; repairs can always be had.

We shall be glad to send the wrenches for trial.

No. 16 has eye on the end of handle for use with tackle.

For Standard Packages, with Weights and Measurements, see page 58

Size	**No. 10**	**No. 11**	**No. 12.**	**No. 13**	**No. 13 1/2**	**No. 14.**	**No. 15.**	**No. 16.**
Price, with flat link chain, each	**$2.50**	**$3.50**	**$5.00**	**$7.00**	**$9.00**	**$11.00**	**$18.00**	**$40.00**
Price, with cable chain, each	**2.25**	**3.25**	**4.50**	**6.25**	**7.75**	**9.50**	**16.00**	**40.00**
Capacity, size pipe	$\frac{1}{8}$ to $\frac{3}{4}$ in.	$\frac{1}{8}$ to $1\frac{1}{2}$ in.	$\frac{1}{4}$ to $2\frac{1}{2}$ in.	$\frac{3}{4}$ to 4 in.	1 to 6 in.	$1\frac{1}{2}$ to 8 in.	2 to 12 in.	4 to 18 in.
Length, over all	$13\frac{3}{4}$ in.	20 in.	27 in.	37 in.	$44\frac{1}{2}$ in.	$50\frac{1}{2}$ in.	$64\frac{1}{2}$ in.	87 in.
Weight	$1\frac{3}{4}$ lbs.	$4\frac{3}{4}$ lbs.	$8\frac{3}{4}$ lbs.	16 lbs.	21 lbs.	29 lbs.	49 lbs.	137 lbs.
Extra flat link chain, each	**$. 75**	**$1.00**	**$1.50**	**$2.50**	**$3.25**	**$4.00**	**$6.00**	**$13.00**
Extra cable chain, each	**.50**	**.75**	**1.00**	**1.75**	**2.00**	**2.50**	**4.00**	**13.00**
Extra jaws, pair	**1.00**	**1.75**	**2 75**	**4.00**	**4.75**	**5.50**	**7.50**	**16.00**
Length, flat link chain	$9\frac{1}{2}$ in.	$13\frac{1}{2}$ in.	$17\frac{1}{2}$ in.	$22\frac{1}{2}$ in.	31 in.	39 in.	$54\frac{1}{2}$ in.	$74\frac{1}{2}$ in.
Length, cable chain	$9\frac{3}{4}$ in.	$14\frac{1}{2}$ in.	18 in.	27 in.	$33\frac{1}{2}$ in.	42 in.	57 in.	76 in.
Breaking strain, flat link chain	3,600 lbs.	6,700 lbs.	9,800 lbs.	12,500 lbs.	14,300 lbs.	15,700 lbs.	21,800 lbs.	40,000 lbs.
Breaking strain, cable chain	1,200 lbs.	4,000 lbs.	6,000 lbs.	10,500 lbs.	12,500 lbs.	15,000 lbs.	19,000 lbs.	40,000 lbs.
Size iron in cable chain	$\frac{3}{16}$ in.	$\frac{9}{32}$ in.	$\frac{11}{32}$ in.	$\frac{7}{16}$ in.	$\frac{15}{32}$ in.	$\frac{33}{64}$ in.	$\frac{37}{64}$ in.	$\frac{13}{16}$ in.

See Cable Code on page 64.

Same prices for parts of Brock Chain Pipe Wrench of corresponding numbers.

VULCAN CHAIN PIPE WRENCHES

Standard Packages

With Shipping Weights and Measurements

We give below average net and gross weights and measurements of Vulcan Chain Pipe Wrenches when packed in the respective standard quantities of sizes stated. The No. 10 wrench is not included in the following table, because its small size permits packing with other wrenches without enlarging the case. Whenever No. 10 are ordered, their weight, as given on page 43, should be added to obtain total weight of shipment.

These tools are kept in stock packed ready for shipment in the quantities given below for each size. They are, however, furnished in any desired assortment.

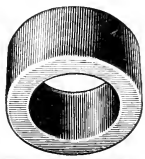
All cases are securely nailed and carefully strapped with wire to ensure safe transit.

Size	No. 11	No. 12	No. 13	No. 13 1/2	No. 14	No. 15	No. 16
Quantity in case	24	24	24	12	12	6	2
Extreme exterior size of cases, in inches	47x12x7	46x12x10	59x14x14	59x14x10	59x14x10	70x14x7	90x12x8
Gross weight, lbs.	154	235	425	317	390	344	306
Net weight, lbs.	132	215	376	277	351	300	260

PARTS FOR AMMONIA UNIONS—Unfinished

Drop-forged from Steel

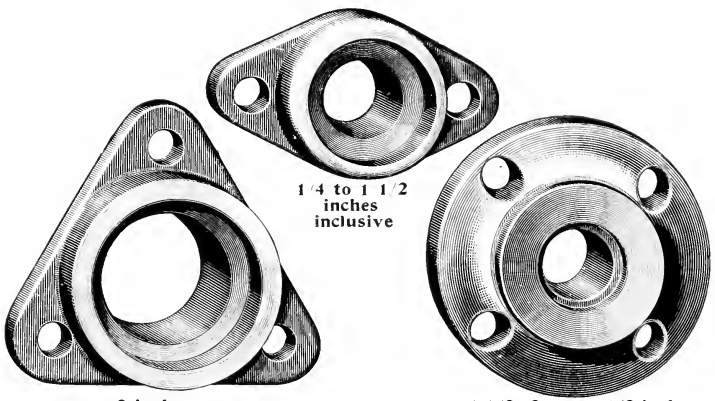
FERRULES



Size, for pipe	1/4	1/2	3/4	1	1 1/4	1 1/2	2
Diameter outside	1 3/32	1 3/8	1 9/16	1 7/8	2 5/16	2 9/16	3 1/8
Diameter inside	17/32	13/16	1 1/16	1 1/4	1 9/16	1 15/16	2 3/16
Length	7/8	7/8	7/8	1	1	1 1/8	1 1/4
Price, each	$.05	.06	.07	.09	.11	.14	.26

For other rings see Shafting Collars, page 54.

FLANGES



Oval and Triangular

Size, for pipe	1/4	1/2	3/4	1	1 1/4	1 1/2	2
Length over all	3 1/8	3 1/2	4	4 1/2	5	5 5/8	5
Width over all	1 11/16	2 1/16	2 1/4	2 9/16	2 7/8	3 1/4	
Thickness at centre	1	1	1	1 1/4	1 3/8	1 3/8	1 3/8
Thickness at bolt-holes	7/16	7/16	7/16	1/2	9/16	9/16	9/16
Distance bet. bolt-holes (C to C)	2 1/4	2 1/2	2 7/8	3 1/4	3 5/8	4 1/8	4 1/16
Diameter of bolt-holes	7/16	7/16	1/2	9/16	9/16	9/16	9/16
Diameter of recess (for packing)	1 3/32	1 3/8	1 9/16	1 7/8	2 5/16	2 9/16	3 1/8
Depth of recess (for packing)	7/16	1/4	5/16	3/8	3/8	3/8	3/8
Price, each	$.11	.12	.14	.17	.24	.30	.44

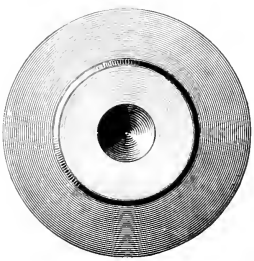
Round Flanges, like cut, for 1, 1¼, 2 and 2½ inch pipe and **Oval Flange** with center hole solid to be drilled for ¾ to ¾ inch pipe to order in quantities.

Full size drawings sent on request.

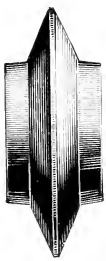
STANWOOD CUTTER WHEEL FORGINGS

No. 2, Exact Size

UNFINISHED



Drop-forged from tool steel and carefully annealed and pickled. They are centered on both sides and are forged accurately so that the expense of finishing is reduced to a mimimum. Cutter wheels made from these forgings are better and cheaper than those cut from the solid bar.



Other designs are also kept in stock; details on application

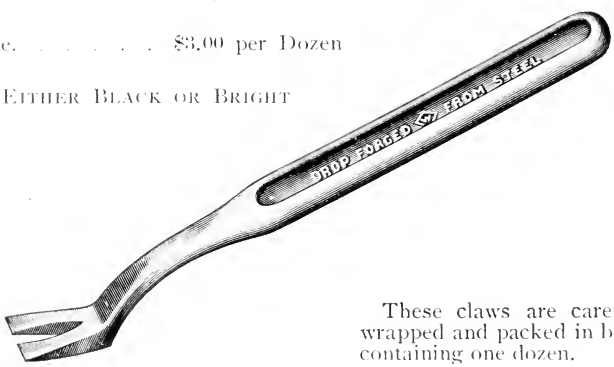
Number	Diameter, Unfinished	Thickness Hub, Unfinished	Width Hub, Unfinished	Price, per 100
1	$1\frac{1}{16}$	$\frac{15}{32}$	$\frac{5}{8}$	$5.00
2	$1\frac{13}{32}$	$\frac{9}{16}$	$\frac{3}{4}$	7.00
3	$2\frac{1}{16}$	$\frac{11}{16}$	$1\frac{1}{32}$	16.00

DROP-FORGED STEEL TACK CLAWS

Tempered and Warranted

Price. . . . . $3.00 per Dozen

EITHER BLACK OR BRIGHT



These claws are carefully wrapped and packed in boxes containing one dozen.

MISCELLANEOUS SPECIALTIES

Full size drawings or samples will be sent on request. Prices on application.

Style No. 3.

Style No. 4.

Thumb Screws—Diam. Shanks $\frac{3}{8}$ in.

Any length, blank or threaded, in quantities.

For other Thumb Screws, see page 55.

Air Valves—2 sizes.

Number	Length	Diam. Head	Spread of Wings	Diam. Stem
5656	$3\frac{1}{2}$	2	$2\frac{5}{8}$	$\frac{7}{8}$
5657	5	$3\frac{3}{16}$	4	$1\frac{1}{8}$

Furnished to order in quantities, unfinished.

For other Valves, see pages 52, 53.

Hammock Hooks—U. S. Government pattern.

Extreme Length $4\frac{1}{8}$ in.

Drilled for $\frac{1}{2}$ in. bolt; special sizes to order in quantities.

Car Register Handles—2 sizes.

Number	Maximum Openings Square	Maximum Openings Round	Extreme Length	Outside Diam. Head
4529	$\frac{1}{2}$	$\frac{11}{16}$	$5\frac{5}{8}$	$1\frac{5}{8}$
5252	$\frac{5}{8}$	$\frac{13}{16}$	$5\frac{7}{8}$	$1\frac{1}{4}$

Toggle Pins—5 sizes.

Diam. Shanks	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1
Length "	5	5	$4\frac{15}{16}$	$4\frac{3}{4}$	$5\frac{15}{16}$

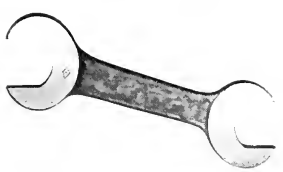
Furnished to order in quantities, unfinished.

Single Head Socket Wrenches—2 sizes.

Number	Extreme Length	Diam. Head	Maximum Openings Square	Maximum Openings Hex. across Flats
5676	$6\frac{1}{4}$	$\frac{25}{32}$	$\frac{7}{16}$	$\frac{17}{32}$
5677	$6\frac{1}{2}$	$1\frac{7}{32}$	$\frac{1}{2}$	$\frac{9}{16}$

Furnished in quantities with openings in head broached square or hexagon; details on application.

For other Socket Wrenches see page 28 to 31.



Double Head Check-Nut Wrench, No. 97$\frac{1}{2}$.

Extreme Length 8 in.
Thickness Heads $\frac{1}{2}$ in.
Openings milled $1\frac{1}{4}$ and $1\frac{7}{16}$ in. for $\frac{3}{4}$ and $\frac{7}{8}$ in. U. S. Standard Nuts.

Milled to special sizes when required.

See on page 9 the conditions in which they are furnished.

For Single Head Check-Nut Wrenches see page 17.

A full line of Caliper or Snap Guage Forgings for $\frac{1}{4}$ to 4 inches inclusive, in preparation.

Special Code for Wrenches, Lathe Dogs and Hoist Hooks with Quantities

Supplemental to Codes used as per Page 7.

Cable Address—"Willrich, Brooklyn"

When using this code, add the number showing sizes desired; for example: a dispatch reading "Isolation fifteen" would order 10 unfinished wrenches No. 15; reading "Muster four ten twelve" it would order 5 each Nos. 4, 10, 12 Semi-finished wrenches. A dispatch reading "Islet six Mustiness eight Zinepro eight" would order 4 unfinished wrenches No. 6, 10 semi-finished wrenches No. 8 and 15 lathe dogs No. 8; a dispatch reading "Putamen two Zodiac twenty-six Hydropic seven" would order 2 finished wrenches No. 2, 25 lathe dogs No. 26 and 10 Vulcan hoist hooks No. 7.

A further saving may be made by using in connection with this code, the "Table of Numerals," pages 749-757 Lieber's Standard Code (1898), or the "Serial Numbers," pages 632-641 Western Union Code (1900). Thus a dispatch reading "Isolation Sabientes" (W. U. Code) would mean 10 unfinished wrenches each, Nos. 10, 11, 12, 13, 14, 15, 17 and 18, and a dispatch reading "Hylobate Sibmah" (W. U. Code) would mean 20 Vulcan hoist hooks each, Nos. 2, 3, 4, 5.

Table Combining Quantities and Goods

Quantities	Unfinished Wrenches	Semi-finished Wrenches	Finished Wrenches	Lathe Dogs	Vulcan Hoist Hooks	Quantities
1	Islam	Muslin	Pustular	Zealless	Hybrid	**1**
2	Islamitic	Musquash	Putamen	Zealot	Hyalite	**2**
3	Islander	Musrol	Putative	Zedoary	Hydra	**3**
4	Islet	Mussel	Putrid	Zeolite	Hydrant	**4**
5	Isolate	Muster	Putty	Zibilina	Hydrogen	**5**
6	Ironed	Musician	Putrescent	Zarathan	Hurler	**6**
10	Isolation	Mustiness	Puzzle	Zimborio	Hydropic	**10**
12	Irongate	Musket	Pirate	Zeladora	Hurrah	**12**
15	Isosceles	Mutable	Pigmy	Zinepro	Hygeian	**15**
20	Issuing	Mutage	Pyramid	Zinkenite	Hylobate	**20**
25	Isthmian	Mutation	Pyrite	Zodiac	Hymn	**25**
30	Italics	Mutely	Pyrology	Zolfatea	Hyphen	**30**
40	Iterate	Mutilate	Pyroscope	Zoneless	Hyssop	**40**
50	Ivory	Mutineer	Putridness	Zufolare	Hyperbola	**50**
100	Ivy	Mutton	Pyritical	Zumology	Hypericon	**100**
150	Itching	Mutual	Pyrotechny	Zozymus	Hypnology	**150**
200	Isthmus	Muzzle	Putridity	Zumbayar	Hymeneal	**200**

CODE FOR VULCAN CHAIN PIPE WRENCHES

Cable address, "WILLRICH, BROOKLYN"

Table Combining Sizes and Quantities

With Flat Link Chains

Quantity Wanted	No. 10	No. 11	No. 12	No. 13	No. 13 1/2	No. 14	No. 15	No. 16	Quantity Wanted
1	Vacca	Valerus	Vasatal	Velinum	Vennones	Vergilia	Vertumnus	Viadrus	**1**
2	Vadavero	Valgato	Vasarhely	Veliocassi	Ventidius	Verginius	Verulanus	Vialis	**2**
3	Vadimonis	Valgdai	Vascones	Veliturna	Venulers	Vergium	Vesagus	Viasma	**3**
4	Vaga	Valgius	Vasilipot	Velites	Venusium	Vergobret	Vesbius	Vibidia	**4**
5	Vagedrusa	Vallebana	Vaticanus	Velitrae	Vepicus	Vermiejo	Vescianus	Vibiones	**5**
6	Vigevano	Villia	Vindex	Virbius	Viridom	Visellus	Visurgis	Vipsani	**6**
10	Vagellius	Valombro	Vatinius	Vellari	Verdunia	Verodocti	Vescular	Vibius	**10**
12	Vittellia	Viterbon	Vitisator	Vitricus	Vogesus	Vocontia	Vogheral	Volagin	**12**
15	Vageni	Vaniah	Vatronus	Velletri	Veragri	Veromandu	Veseris	Vibo	**15**
20	Vagesus	Vandalia	Vaucluse	Venatrum	Verania	Veronesum	Vesevas	Vibulenus	**20**
25	Vahalis	Vangiones	Vauconicus	Venaisin	Verbigenus	Veronica	Vesontis	Vibullius	**25**
30	Vaicus	Vannius	Velabrum	Venango	Vercellae	Verrugo	Vesoul	Vicapota	**30**
35	Vajetha	Varanes	Velanius	Venedae	Vereginum	Versetz	Vestales	Vicellius	**35**
40	Valamirus	Vardaei	Veleda	Veneti	Veretum	Vertagus	Vesticius	Vicintia	**40**
45	Valentinia	Variabra	Veiia	Venilia	Vergasil	Verticosia	Vestilium	Victorina	**45**
50	Valerianus	Vashni	Velibrio	Venloo	Vergellus	Vertisens	Vestini	Victumvia	**50**
100	Votienus	Vulcovan	Vulcanalia	Vulcatius	Vulsinum	Vultura	Vulturnum	Vulturtius	**100**

A despatch reading "Valgius" would order four No. 11 with Flat Link Chains; a despatch reading "Vepicus Verrugo" would order five No. 13½ and thirty No. 14 with Flat Link Chains.

If wrenches are wanted with Cable Chain, add the code word "Vophsif"; a despatch reading "Veleda Vophsif Velinum" would order forty No. 12 with Cable Chain and one No 13 with Flat Link Chain.

PARTS:
- One pair of Jaws for Vulcan Chain Pipe Wrench . . . . . Code word, "Vesulusia."
- One-half pair Jaws for Vulcan Chain Pipe Wrench . . . . . Code word, "Vettius."
- Flat Link Chain for Vulcan Chain Pipe Wrench . . . . . Code word, "Veturia."
- Cable Chain for Vulcan Chain Pipe Wrench . . . . . Code word, "Vetulonia."

For details of Vulcan Wrenches see page 57.

CODE FOR STANDARD SPECIALTIES

Supplemental to Codes used as per page 7

Cable Address—"Willrich, Brooklyn"

Koppelaars	Air Valves.
Kopglas	Automobile Axle End.
Kopfwurm	Automobile Steering Gear Parts.
Kopfzeug	Automobile Steering Knuckle.
Kopfwunde	Crank Shafts.
Kopfunter	Connecting Rods.
Kopflaenge	Eye Bolts—forgings.
Kopflauch	Eye Bolts—threaded.
Kopfringes	Ferrule Forgings for Ammonia Unions.
Kopfriemen	Flange Forgings for Ammonia Unions.
Koppelbalk	Hammock Hooks.
Koppelband	Handles—Car Register.
Kopfkissen	Handles—Crank, broached.
Kopfkiemer	Handles—Crank, finished.
Kopfkohl	Handles—Crank, forgings.
Kopflos	Handles—Machine, ball pattern.
Kopfloser	Handles—Machine, cone pattern.
Kopftuch	Hoist Hooks, Eye.
Kopfton	Hoist Hooks, Shank.
Kopfuebung	Igniter Levers.
Kopfhaut	Key Forgings
Kopflerche	Lathe Dogs—Bent Tail.
Kopflinie	Lathe Dogs—Straight Tail.
Kopfputz	Pipe Cutter Wheel Forgings.
Kopfwasser	Rod Ends.
Kopfputzes	Shafting Collars.
Kopfstener	Spanners—Face.
Kopfsprung	Spanners—Hook.
Kopfgelder	Spanners—Light Hook.
Kopfgeld	Spanners—Pin.
Kophamers	Starting Lever.
Kopmessen	Tack Claws, Black.
Kopfschatz	Tack Claws, Bright.
Kopfmohn	Thumb Nuts, Blank.
Kopfmuskel	Thumb Nuts, threaded.
Kopfnicken	Thumb-Screw Blanks, plain.
Kopfpein	Thumb-Screw Blanks, shoulder.
Kopfpfuehl	Thumb-Screws threaded, plain.
Kopfplatte	Thumb-Screws threaded, shoulder.
Koppelbord	Toggle Pins.
Kopfhalter	Tool Posts.
Kopfhaaren	Tool Post Rings.
Kopfhaar	Tool Post Wedges.
Kopierbuch	Valve Stems.
Kopfueber	Wire Rope Sockets, closed.
Kopftuches	Wire Rope Sockets, open.

Wrenches

Kopfarbeit	Box Wrenches, single-head.
Kopftoenen	Car Wrenches.
Kopfskegel	Check-nut Wrenches.
Kopfgicht	Construction Wrenches.
Koperkies	Engineers' Wrenches, double-head.
Koperig	Engineers' Wrenches, single-head.
Kopfschild	Hexagon Cap-Screw Wrenches.
Kopfstimme	Machine Wrenches.
Kopfende	"S" Wrenches.
Koperwerk	Set-Screw Wrenches, double-head.
Kopersteen	Set-Screw Wrenches, single-head.
Koperzout	Set-Screw Wrenches, triple-head.
Kopfstueck	Socket Wrenches, double-head.
Kopfstoss	Socket Wrenches, single-head.
Kopfsohle	Straight Concave Handle Wrenches.
Kopfseite	Taper-Handle Wrenches.
Kopfbandes	Tool Post Wrenches.
Kopfartig	Track Wrenches.
Koperzout	Triple-Head Wrenches.
Kopialien	Vulcan Chain Pipe Wrenches.
Koperslak	Openings to be Milled.
Koppelbout	Openings to be U. S. Standard.
Koperslaan	Openings to be Whitworth Standard.
Kopernikus	Wrenches are wanted Finished.
Koperoker	Wrenches are wanted Semi-finished.
Koperroest	Wrenches are wanted Unfinished.

Code for Phrases Relating to Orders for Special Forgings

Supplemental to Codes used as per page 7

Cable Address—"Willrich, Brooklyn"

Subject	Code Word	Phrase
Allowance	Kourgan	We will add usual allowance for machining (1/32 in. or .9 m/m) on surfaces marked.
	Kourilien	We will add usual allowance for machining (1/32 in. or .9 m/m) on each surface.
	Kourakin	We will add usual allowance for machining (1/32 in. or .9 m/m) plus draft.
	Kourkho	What allowance shall we make for machining or grinding?
	Kouseband	Add your usual allowance (1/32 in. or .9 m/m) for machining.
	Kousso	Allow for finishing ....
Annealing	Krachneu	Forgings would be annealed.
	Krachsauer	We require forgings annealed.
	Krachtiger	We think annealing unnecessary.
Dies	Kraftgeist	Alter dies to
	Kraftmalz	New dies necessary.
	Kraftlehre	Dies broke while forging.
Draft	Kounniss	Add the necessary draft.
	Koukleum	Draft, if any, should be added.
	Koulbac	Draft, if needed, may be taken off.
	Kouler	Shall we allow usual draft—7 degrees?
	Koukarien	.....degrees draft necessary around edges, where dies part.
	Koudzweet	Draft is necessary inside and outside.
	Koudvuur	Make as little draft as possible.
	Koudsmeden	Usual draft (7 degrees) on forgings will be satisfactory.
Holes	Kraalboom	Forgings would be solid, without holes.
	Kraaidoorn	Holes would be centred for drilling.
	Kraakwater	Holes would be punched, leaving draft on edges.
Iron	Kraempeln	Drop-forgings from iron.
Lead-Proofs	Kraftreich	Lead-proof(s) is (are) satisfactory.
	Kraftquell	Lead-proof(s) is (are) not correct.
	Kraftstuhl	Is (are) lead-proof(s) correct?
	Kraftvoll	Lead-proof(s) not required.
	Krattnuss	Is lead-proof required?
	Kragenente	Shall we send lead-proof, showing change?
	Kraftmehl	Lead-proof(s) has (have) been sent (by .....)
	Kraftmilch	Lead-proof(s) will be sent (by .....)
Pickled	Krachtvol	Forgings would be pickled.
	Kraechzen	We require forgings pickled.
	Kraechzet	We think pickling unnecessary.
	Krachten	Forgings would be annealed and pickled.
Sample	Kraamwaren	Sample(s)—or drawing(s)—is (are) forging size(s).
	Kraanbalk	Sample(s)—or drawing(s)—is (are) finished size(s).
	Kraanbek	Sample(s)—or drawing(s)—is (are) finished size(s) allow for machining on surfaces marked . . . .
	Kraanvogel	Is (are) sample(s)—or drawing(s)—forging or finished size(s)?
Steel	Kraenker	Drop-forgings from.....
	Kraemerin	Drop-forgings from soft steel.
	Kraenzen	Drop-forgings from open-hearth (Siemens-Martin) steel.

SPECIAL DROP-FORGINGS

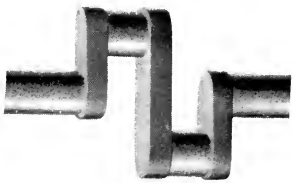
THE art of forging with drop-hammers, which may be designated as "machine blacksmithing" developed about 1853 when Colonel Samuel Colt adopted these machines to make parts for fire-arms. They have since been greatly improved and the products of the drop-forging industry are now used in a great variety of mechanical arts, some of which we outline on page 70.

Drop-forgings are made in dies which are in two parts. One part is fastened in the ram or hammer itself, which moves vertically between two uprights or guides and is raised by means of friction rolls controlled by the operator; the other part is fixed in the anvil or base of the hammer. The ram rises until released, when it falls instantly, striking with the upper die the heated bar of metal placed on the bottom die and forcing it into impressions in both dies. By a series of such blows the completed article is formed. Since 1884 we have devoted ourselves exclusively to making the best quality of this work known generally as "Machine Forging". Our original forging plant was three drop-hammers; it now consists of forty-three drop-hammers with trip-hammers, steam hammers, upsetting machines and other apparatus, forming a complete plant.

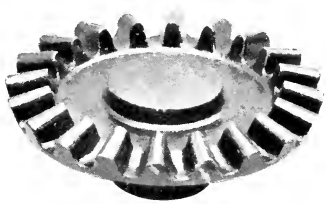
The necessary dies are made from a drawing or model, preferably the latter, as it facilitates designing the dies and frequently permits our quoting lower prices than could be given from a drawing. We must know whether drawing or model shows finished or forging size; if finished size we need also to know the allowance desired in machining. It is usual to add $\frac{1}{32}$ inch on each surface to be machined unless the piece is to be finished by grinding or polishing only, in which case $\frac{1}{100}$ inch is allowed; surfaces not

L. of C.

to be machined or ground are made close to size. Forgings vary slightly in thickness—say from $\frac{1}{100}$ inch to $\frac{1}{32}$ inch—depending on their shape and the material used. They can, however, be made to gauge by a re-striking operation; this often requires separate dies and entails additional expense. In addition to forging dies, the cost and endurance of which vary with the work required of them, trimming dies are necessary to remove the surplus metal thrown out between the forging dies in working.



We include but a portion of the cost of tools in our estimates and **cannot sell them at the price given in our quotations.** We prefer not to sell dies at all because designing them involves our best skill which we do not care to make generally available. Nor is it advantageous to the customer to **own** the dies for if made to suit our methods they are unlikely to work well elsewhere and alterations would be required before they would fit the machines in other shops. We assume all expense of breakage and maintenance of dies, keeping them ready for



our customer's service but should he own them, he would naturally take these risks. We charge practically only for the **exclusive use of dies;** this the customer controls, for we will not make forgings from them for others without his written consent.

The lead proof which we submit from each die to our customer often varies from the model or drawings by what is called "draft". This is the taper necessary on the forgings to permit drawing them from the dies while working and averages seven degrees. It can be obtained by adding to or taking from the forging; unless instructed to the contrary, we **add** the necessary draft

We carry a large and assorted stock of material but with new dies, where the size of metal required to make the forgings cannot be determined until they are tried in the hammer, delays in obtaining the right sizes sometimes occur. We cannot use poor material and drop-forgings are, therefore, not only superior to hand-forgings or castings, because the metal is improved by the forging operation but also because the nature of the process requires a good quality of material.

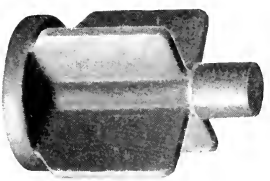
We are daily machining many varieties of the products of our own forge and can often determine from this experience what material is best for a customer's use and furnish it in proper condition for his processes.

Forgings from steel of high carbon usually require annealing before they

can be machined; we have a large and modern equipment both for this work and for case-hardening. While making forgings we carefully brush them with steel wire brushes to remove the scale but if they are to be machined we pickle them in diluted sulphuric acid to ensure the complete removal of this hard outer surface. We sometimes tumble small pieces instead of pickling them.

We can often save customers expense if informed of the use for which the forgings are intended. The price is largely affected by the quantity made with one setting of the tools. It costs as much to set dies for 100 as for 1000 pieces and the forging work is also more costly in small lots. Prices for special drop-forgings are made per piece, not per pound and vary with the nature of the work, the material used and the quantity taken.

We guarantee quality of both workmanship and material and replace without charge forgings that are imperfect or defective but **we cannot be responsible for the cost of labor put on them after they have left our hands.**



The cheapest forgings in the long run are those made uniform in size and quality and close to finished dimensions, thus saving labor, time, tools and money.

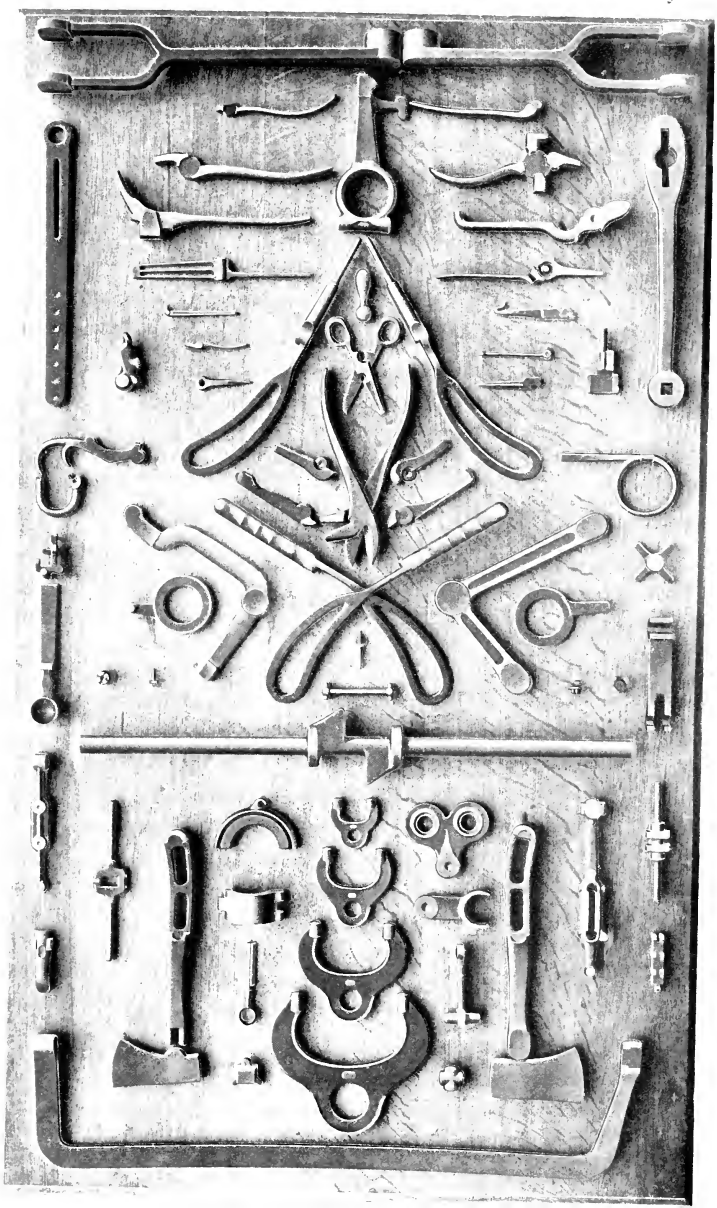
SPECIAL DROP-FORGINGS MADE FOR

Automobiles,
Bicycles,
Bolt Cutters,
Carpenters' Tools,
Chucks,
Conductors' Punches,
Cooking Ranges,
Dairy Machinery,
Elevators,
Fire Arms,
Golf Irons,
Gymnasium Apparatus,
Hydrants,
Injectors,
Jewelers' Tools,
Knitting Machinery,
Laundry Machinery
Lawn Mowers,
Locomotives,
Lubricators,
Machine Tools,
Machinists' Tools
Nail Pullers,
Oil Well Apparatus,
Ordnance,
Projectiles,
Rachet Drills,
Sewing Machines,
Shoe Machinery,
Special Nuts,
Steam Pumps,
Sugar Machinery,
Tobacco Machinery,
Typewriters,
Water Motors,

Adjustable and Solid Wrenches,
Agricultural Machinery,
Air Compressors,
Automatic Sprinklers,
Boilermakers' and Blacksmiths' Tools,
Bookbinders' Machinery,
Bottling and Wiring Machinery,
Cable Transmission Machinery,
Chain Links and Hooks,
Cotton, Flax, Jute and Wool Machinery,
Dynamos, Electric Motors and Apparatus,
Harness and Saddlery,
Hemp and Wire Rope Machinery and Appliances,
Hydraulic and Lever Jacks,
Ice Cutting Machinery,
Lumbermen's Tools and Appliances,
Marine Specialties,
Pipe Cutting and Threading Machinery,
Pipe Wrenches, Cutters and Vises,
Printing Presses and Printers' Tools,
Railway Brakes, Tools and Appliances,
Refrigerating Machinery,
Rock Drills and Mining Machinery,
Saw Mill Machinery,
Steam, Gas and Hot Air Engines,
Stonecutters' Machinery and Tools,
Store Service and Cash Registry Machinery,
Surgical Instruments,
Tap Wrenches and Dies,
Telephone and Telegraph Appliances,
Trolley and Cable Railway Fittings,
Weighing Machines,
Wood-Working Machinery, etc.

Forgings from Tobin Bronze, Copper and Aluminum

Not in stock or for sale but showing character of work done only



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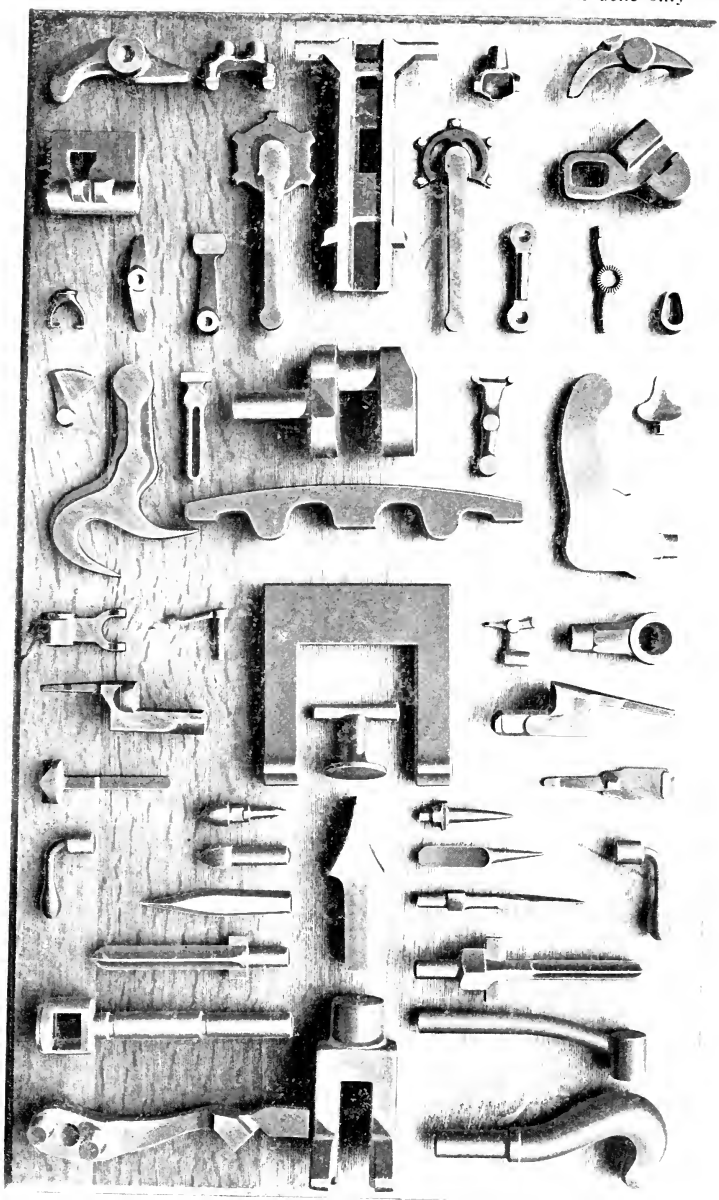

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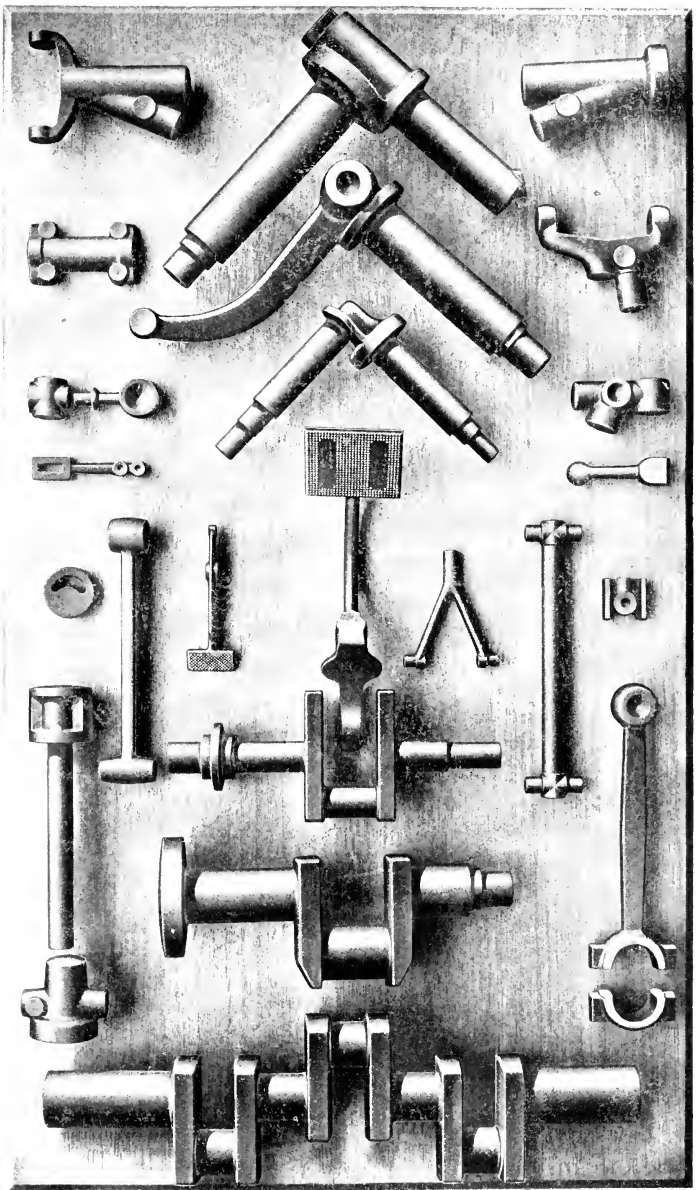

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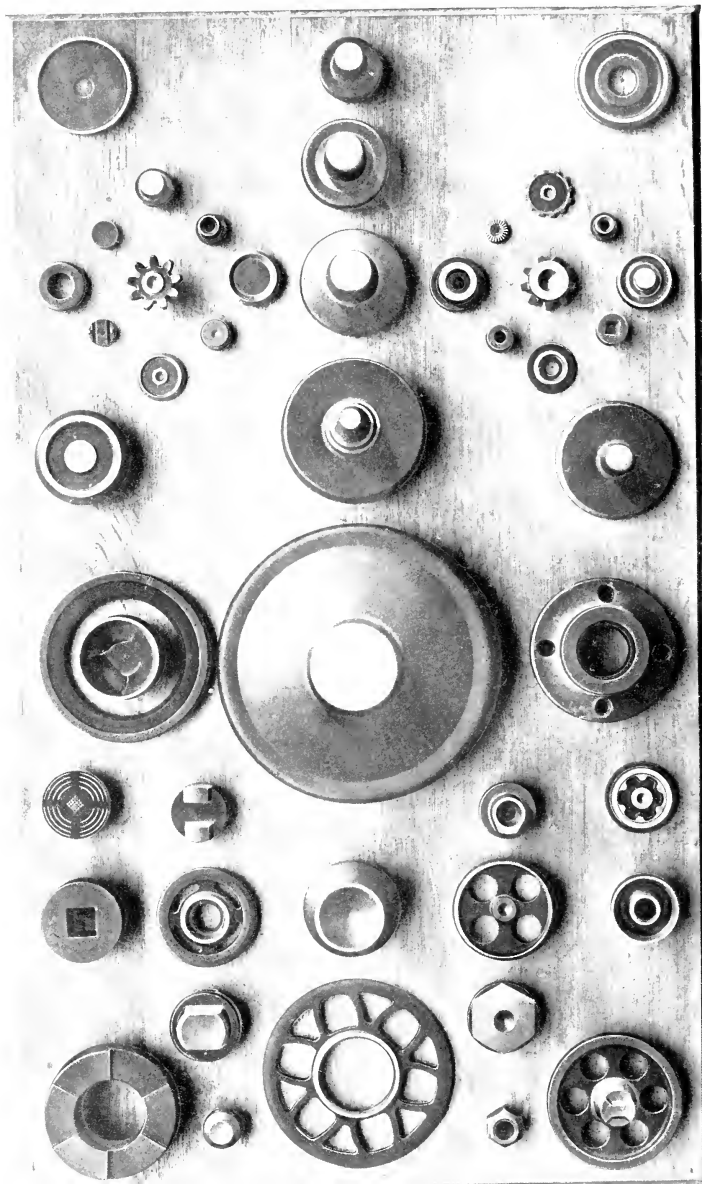

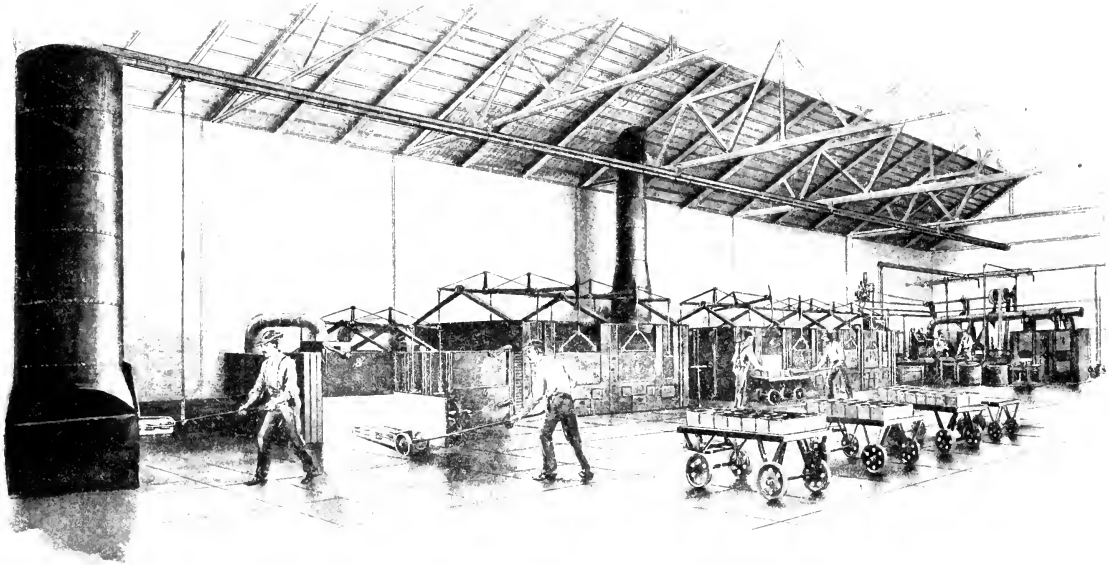

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